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MUSEUMS ASSOCIATION.

GLASGOW MEETING,

1896.



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MUSEUMS ASSOCIATION.

REPORT OF PROCEEDINGS

WITH THE PAPERS READ AT THE

SEVENTH ANNUAL GENERAL MEETING,

HELD IN GLASGOW—JULY 21 TO 25, 1896.

EDITED BY

E. HOWARTH, F.R.A.S., & H. M. PLATNAUER, B.Sc.

LONDON :

DULAU AND Co.

1896.



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INTRODUCTION.

ATTER the Meeting of the Association in Dublin in 1894, following as that did upon the Meeting in London, it would have been quite in accordance with the natural sequence of events if the Association had met in Scotland in 1895. And this, in fact, the Council desired to do, and only failed because that desire was not shared by the Museum authorities in Edinburgh, which city it was then felt ought properly to be selected for the first visit to Scotland. Though the Association has not officially paid a visit to the renowned picturesque Capital of Scotland, it has this year had the opportunity of acquainting itself with the enterprising, humanely active, and kindly hospitable City of Glasgow, where it received an exceptionally hearty welcome, and the members were able to note with extreme gratification the high position held by Museums and Art Galleries in the appreciation of the City of Glasgow.

The Meeting was a most successful one from every point of view, and in some of its important features it exceeded any of the previous Conferences.

The city authorities of Glasgow have recognised beyond almost any other provincial municipality the great value of Museums and Art Galleries to the people of a large community, and, while paying due attention to the essential characters of a Museum for advancing the knowledge of science and art in the broadest sense, they have endeavoured to meet the natural requirements of an

extensive city by establishing subsidiary Museums and Galleries in the various parks and open spaces belonging to the Corporation. Thus, while the highest branches of science and art are to be fully cared for in a magnificent building in Kelvingrove Park, which is now being erected at a cost of a quarter of a million of money, to receive the contents of the present temporary Art Galleries and General Museum, they have also established a People's Palace at Glasgow Green, and an Exhibition Gallery at Queen's Park, and still further contemplate founding similar institutions in other parts of the city, so that the people over the widely-scattered area of this great municipality may enjoy the wholesome means of mental recreation and pleasant instruction which Museums and Art Galleries afford.

The great extension of urban constituencies obviously points to the multiplication of Museums and Exhibitions in their various divisions, and it is quite as feasible and salutary to establish several of these in one large city as it is to increase the number of libraries. The illimitable sources from which natural objects are derived, and the great variety in which human skill and ingenuity can be displayed in the productions of art and handicrafts, make it possible to furnish different Museums in a manner special to one division of nature, art, or handicraft, and thus make them suitable to the particular locality in which they are placed. The interest and pleasure taken by the public in Museums and Art Galleries are everywhere increasing, and the important place they occupy as a pleasant means of advancing knowledge is on all sides recognised.

In his address the President, after describing the growth of the Museums and Art Galleries in his own city, concluded with an exceedingly thoughtful and eloquent

review of the Museum question in general, which will be read with keen interest by all interested in the well-being of the people.

The whole of the arrangements for the Meeting were carried out by the Corporation of Glasgow in a very liberal, hospitable spirit, with a careful attention to the comfort and convenience of the members, and a ready facilitation of the order of business.

In addition to the various Glasgow Museums, the members of the Association paid a visit to Perth on the invitation of the Lord Provost, by whom they were cordially entertained, as well as by Sir Robert Pullar. They there also had an opportunity of inspecting one of the most recent, as it is the most interesting and attractive, Museums of a purely local character that has ever been formed.

Mr. James Paton is the first President associated with the Art side of Museums,—previous occupants of the position being more intimately associated with Science. The Council wish to emphasize the fact that Art and Science Museums are equally recognised by the Association.

LIST OF MUSEUMS AND ASSOCIATES
BELONGING TO THE ASSOCIATION, WITH THE NAMES OF THE
REPRESENTATIVES AT THE GLASGOW MEETING.

MUSEUMS.

Baroda . . .	Manchester: Owens
Belfast . . .	College. . . <i>W. E. Hoyle, M.A.</i>
Blackburn . . .	,, Queen's Park . .
Bolton . . .	Middlesborough . .
	Newcastle-upon-Tyne
	Northampton . .
	Nottingham . . . <i>Prof. J. W. Carr,</i> <i>M.A.</i>
Bootle . . .	Oxford Museum of Comparative Anatomy . .
Bradford . . .	Perth . . . <i>Henry Coates,</i> <i>F.R.S.E., Alex. M.</i> <i>Rodger.</i>
Brighton . . .	Saffron Walden . .
Cape Town . . .	Salford . . . <i>B. H. Mullen, M.A.</i>
Cardiff . . .	Salt Lake City (Deseret Museum)
Chester . . .	Sheffield: Public Museum . . <i>Ald. W. H. Brittain,</i> <i>J.P., F.R.G.S., E.</i> <i>Howarth, F.R.A.S.</i>
Dundee . . .	,, Ruskin Museum <i>William White.</i>
Glasgow . . .	Southampton . .
	Stockport . . .
	Sunderland . . . <i>Jas. M. E. Bowley.</i>
	Sydney (Australian Museum) . .
Hereford . . .	Warrington . . . <i>Councillor H. Roberts,</i> <i>J.P., Chas. Madeley.</i>
Liverpool . . .	Winchester College
London: Horniman's Museum	Worcester . . . <i>Wm. H. Edwards.</i>
,, Parkes Museum of Sanitary Institute	York . . . <i>H. M. Platnauer,</i> <i>B.Sc.</i>
,, Sir Henry Peek's Museum	
,, Pharmaceutical Society . . .	
Maidstone . . .	

ASSOCIATES.

Those printed in italics were present at the meeting.

Anderson, Professor W. C. F., Firth College, Sheffield.
Bather, F. A., British Museum.
Bolton, H., Manchester.
Brown-Goode, G., U.S. National Museum.
Brünchorst, Dr. J., Bergen.
Campbell, J. MacNaught, Kelvingrove Museum, Glasgow.
Carr, Mrs. J. W., Nottingham.
Cheeseman, J. F., Auckland Museum, N.Z.
Croston, J. W., Prestwich.
Denny, Professor Alfred, Firth College, Sheffield.
Donner, E., Fallowfield, Manchester.
Donner, Mrs. E., Fallowfield, Manchester.
Dyer, Dr. Henry, Glasgow.
Fleming, Mrs. A., Glasgow.
Fleming, James, Glasgow.
Flower, Sir W. H., British Museum.
Greening, Linnaeus, Warrington.
Greenwood, Thomas, Elstree, Herts.
Harlin, J. Smith, American Museum of Natural History.
Henshaw, Samuel, Society of Natural History, Boston, Mass.
Howse, Richard, Museum, Newcastle.
Hughes, Prof. T. M'Kenny, Woodwardian Museum, Cambridge.
Hutton, Capt. F. W., Canterbury Museum, Christchurch, N.Z.
Jackson, Dr. Robert T., Harvard University.
Jennings, A. Vaughan, Royal College of Science, Dublin.
King, Prof. T., Glasgow.
Kirk, Charles, Glasgow.
Longfield, T. H., Dublin.
Lucas, F. A., National Museum, U.S.A.
M'Carthy, Mrs., Glasgow.
Madeley, Mrs., Warrington.
Martin, R. F., London.
Meyer, Dr. A. B., Dresden.
Monks, F. W., Warrington.
Norman, Canon, Burnmoor.
Parker, Prof. T. Jeffrey, Otago University Museum, N.Z.
Paton, Edward L., Perth.

Paton, Leslie, Glasgow.
Hipson, Miss Emma, London.
Potter, Prof. M. C., Newcastle.
Rankin, James, Glasgow.
Rennie, Thomas, Glasgow.
Rudler, F. W., Museum of Practical Geology, London.
Scharff, Dr. R. F., Museum of Science and Art, Dublin.
Stirrup, Mark, Bowdon, Cheshire.
Suter, Frank, London.
Traill, Professor James W. H., Aberdeen.
Weiss, Prof. F. E., Owen's College, Manchester.
Woodward, A. Smith, British Museum.
White, Thomas, London.
Woolnough, Frank, Ipswich.
Yates, Geo. C., Lancashire and Cheshire Antiquarian Society.

MUSEUMS ASSOCIATION.

STATEMENT OF INCOME AND EXPENDITURE FOR THE YEAR ENDING JUNE, 1896.

Balance from previous Year,	•	•	•	£55 16 9
Members' Subscriptions, 1895;	•	•	•	34 13 0
Associates' Arrears, 1894,	•	•	•	1 1 0
" Subscriptions, 1895,	•	•	•	2 5 2
Annual Reports,	•	•	•	4 10 6
Advertisements,	•	•	•	1 7 6
Discount from Printers,	•	•	•	12 6 5
Banker's Interest,	•	•	•	9 5 2
Reporters' Notes,	•	•	•	48 13 0
Subscription to Ball Testimonial,	•	•	•	1 16 0
Plates for Reports,	•	•	•	1 10 0
Printing,	•	•	•	0 2 0
Receipt Book and Stationery,	•	•	•	
E. Howarth—Expenses and Disbursements,	•	•	•	
H. M. Platnauer—	•	•	•	
Printing Reports,	•	•	•	
Binding Reports,	•	•	•	
Stationery Cabinet,	•	•	•	
Banker's Commission,	•	•	•	
1 0 11	•	•	•	

Balance,	33	8	11
							<u>£122</u>	5	8

correct,
CHARLES MADELEY.
JOHN J. OGLE.

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GENERAL PROCEEDINGS.

JULY 22, 1896.

CANON NORMAN took the chair, and, after referring to the kind reception given to the Association, called on the Lord Provost to speak.

THE LORD PROVOST welcomed the Association to the city ; the municipality had had great pleasure in inviting the Association, and that was increased when the invitation was accepted. In providing for the education of the people, the aim of the Corporation had been to make that education thorough, and to avoid one-sidedness. They had therefore provided for bodily training and mental graces as well as for simple instruction, and they believed that the culture they desired to spread could be secured in no better way than by the support and encouragement of Art Galleries and Museums. Therefore, they felt in full sympathy with the Museums Association, the object of which was the diffusion of knowledge of Arts and Science among the people. This was a work in which all municipal bodies should take an interest, and the Museums Association did useful work by promoting feelings of fellowship and emulation among various cities.

CANON NORMAN spoke of the pleasant associations that he had with the west coast of Scotland, especially in connection with several successful dredging expeditions. He then introduced the President-elect, MR. JAMES PATON. The retiring President then went on to point out that Mr. Paton was the first Art Curator who had been President of the Association, and he hailed the interest taken by the Association in Art as a healthy sign of breadth of sympathy.

GENERAL MEETING.

JULY 24, 1896.

THE HONORARY TREASURER read the Financial Statement, which was adopted by the meeting.

PROFESSOR E. RAY LANKESTER was elected President for the following year.

Resolved that the question of Vice-Presidents be left to the Secretaries in consultation with the Council, if necessary.

MR. ALDERMAN W. H. BRITTAIR was unanimously re-elected Honorary Treasurer.

The following were elected to constitute the Council:—R. Cameron, M.P.; F. A. Bather, M.A.; Prof. J. W. Carr, F.G.S.; H. Coates, F.R.S.E.; Dr. H. O. Forbes; F. V. James, F.S.A.; T. H. Longfield, F.S.A.; C. Madeley; W. W. Midgley; F. W. Rudler, F.G.S.; Councillor Steele; Dr. J. E. Talmage.

MR. HOWARTH and MR. PLATNAUER were re-elected Secretaries.

THE PRESIDENT gave notice of his intention to move for an alteration of Rule VI. by the insertion of the words "or Secretary and Editor" after the words "two Secretaries."

MR. BOLTON gave notice of a proposal for further alteration of Rule VI. by the omission of the word "two" before Vice-Presidents, and by the substitution of "four ordinary members of Council to retire each year" for "two ordinary members of Council to retire each year."

MR. HOYLE gave notice of an intention to move for a rule which should provide for the election of Honorary Members.

MR. BOLTON asked that the Council would appoint a Committee to get together a collection of Museums Handbooks.

MR. BATHER urged on the Council the desirability of publishing yearly a list of all references to Museums and Museum Work contained in the periodical literature of the previous year.

MR. E. HOWARTH gave notice of an alteration in Rule I., to delete the words "situated in the United Kingdom" after Museums.

OFFICERS AND COUNCIL.

PRESIDENT.

JAMES PATON, F.L.S.

PRESIDENT-ELECT.

Prof. E. RAY LANKESTER, LL.D., F.R.S. (Oxford).

PAST-PRESIDENTS.

J. W. CLARK, M.A.

Sir W. H. FLOWER, K.C.B., D.Sc.,
F.R.S.

W. BOYD DAWKINS, M.A., F.R.S.

The Rev. Canon NORMAN, M.A.,
D.C.L., F.R.S.

VICE-PRESIDENTS.

HENRY DYER, D.Sc. Councillor J. SHEARER.

TREASURER.

Alderman W. H. BRITTAINE, J.P., F.R.G.S. (Sheffield).

COUNCIL.

F. A. BATHER, M.A. (British Museum).
R. CAMERON, M.P. (Sunderland).
HENRY COATES, F.R.S.E. (Perth).
Professor J. W. CARR, M.A., F.L.S.,
F.G.S. (Nottingham).
H. O. FORBES, LL.D. (Liverpool).
F. VALLANCE JAMES, F.S.A.
(Maidstone).

T. H. LONGFIELD, F.S.A. (Dublin).
C. MADELEY (Warrington).
W. W. MIDGLEY, F.R.Met.S.
(Bolton).
F. W. RUDLER, F.G.S. (London).
Councillor STEELE (Glasgow).
Professor J. E. TALMAGE (Salt Lake
City).

GENERAL SECRETARIES.

H. M. PLATNAUER, B.Sc.,
F.G.S. (York).

E. HOWARTH, F.R.A.S., F.Z.S.
(Sheffield).

LOCAL SECRETARY.

JAMES RANKIN, B.Sc., Natural History Department, Glasgow University.

LOCAL COMMITTEE.

The Hon. the LORD PROVOST (Sir
James Bell, Bart.).
Sir J. NEILSON CUTHBERTSON.
Councillor BILSLAND.
Bailie BURT.
Prof. BOWER, D.Sc., F.R.S.
Professor CLELAND, LL.D., F.R.S.
Professor COATES, M.D.
HENRY COATES, F.R.S.E.
Councillor CRAWFORD.
Councillor CUTHBERT.
Preceptor DICKSON.
EBENEZER DUNCAN, M.D.
HENRY DYER, D.Sc.
Professor FERGUSON, LL.D.
JAMES FLEMING.

Professor THOMAS KING.
A. J. KIRKPATRICK.
Prof. McKENDRICK, LL.D., F.R.S.
Councillor MAIN.
Councillor MITCHELL.
J. BARCLAY MURDOCH.
Councillor ROBERT MURDOCH.
DAVID MURRAY, LL.D.
Bailie J. R. PATON.
Bailie PETTIGREW.
Councillor SHEARER.
Bailie SINCLAIR.
Councillor STEELE.
GEORGE BELL TODD, M.B.
Professor YOUNG, M.D.
JOHN YOUNG, LL.D.

PROGRAMME OF ARRANGEMENTS.

TUESDAY, JULY 21ST.

11 a.m.	Meeting of Council in the Corporation Galleries of Art. Reception Rooms open.
2 p.m.	Meeting in Corporation Galleries, proceeding from there in Carriages to the Botanic Gardens, Kelvingrove Museum, New Art Gallery Building, Glasgow Green and People's Palace, Queen's Park and Camphill Gallery. Afternoon Tea served at Camphill House at 5 p.m., by kind invitation of Mr. and Mrs. PATON.
	Cards of Invitation to the Reserved Seats at the Burns Centenary Commemoration were issued to Delegates. Lord ROSEBERRY presided at the ceremony in St. Andrew's Hall, at 8 p.m.

WEDNESDAY, JULY 22ND.

10 a.m.	Council Meeting.
10.30 a.m. to 12.30 p.m.	Presidential Address by JAMES PATON, F.L.S. The following papers were read :— On the Arrangement of the Perthshire Natural History Museum. By (1) HENRY COATES, F.R.S.E., (2) ALEX. M. RODGER.
	Type Specimens in Botanical Museums. By EDWARD MORELL HOLMES, F.L.S.
12.30 p.m.	Luncheon by invitation of the Corporation served in the Galleries of Art.
2 p.m.	Visit to the University. Professor Young conducted the party over the Hunterian Museum and University Buildings. Professor M'KENDRICK gave a Demonstration in the Physiological Class-room, and other Class-rooms and Laboratories were visited.

THURSDAY, JULY 23RD.

10 a.m.	Council Meeting.
10.15 a.m. to 1 p.m.	Reading and discussion of the following papers in the Galleries of Art :— Colour Tinting and its application to Microscopic Work. By Dr. G. BELL TODD. Descriptive Labels for the Geological Department, Sal- ford Museum. Prepared by H. BOLTON, F.R.S.E. How may Museums best retard the advance of Science. By F. A. BATHER, M.A. Electrotypes in Natural History Museums. By F. A. BATHER, M.A. Chemistry in Museums. By GEORGE W. ORD.
1 p.m.	Luncheon in the Galleries of Art on the invitation of the Corporation.
2.30 to 4 p.m.	The following papers were read and Business transacted in the Rooms of the Philosophical Society, Bath Street :— Suggestions for a proposed Natural History Museum in Manchester (with Lantern Illustrations). By the Right-Hon. T. H. HUXLEY (communicated by W. E. HOYLE, M.A.). Some Marine Animals as Lantern Slides. Prepared by H. C. SORBY, LL.D., and Exhibited by E. HOWARTH. Business Meeting. Treasurer's Statement, Election of Officers, Council, etc.
7 p.m.	Reception by the Lord Provost (Sir JAMES BELL, Bart.) in the City Chambers.

FRIDAY, JULY 24TH.

10 a.m. to 12.30 p.m.	The following papers were read in the Galleries of Art :— Millport Marine Station. By JAMES RANKIN, B.Sc. A Visit to Miss T. Mestorf, Directress of the Schleswig- Holstein Museum at Kiel. By CLARA NÖRD- LINGER (communicated by W. E. HOYLE, M.A.).
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FRIDAY, JULY 24TH—*continued.*

	Illustrated Lectures in Museums. By THOMAS RENNIE.
	The Lighting of Museums. By THOMAS WHITE.
12.30 p.m.	Lunch in the Galleries of Art on the invitation of the Corporation.
2 p.m.	Leave Buchanan Street Station; arrive at Perth at 4 p.m. Drive through the City, after which, Reception and Tea at the Municipal Buildings on the invitation of Lord Provost DEWAR.
6 to 7.30 p.m.	Visit to the Museum of the Perthshire Natural History Society.
8 p.m.	Supper in the Station Hotel on the invitation of Sir ROBERT PULLAR. Leave Perth at 10.5 p.m. for Glasgow.

SATURDAY, JULY 25TH.

	Excursion by the Ardrishaig Steamer "Columba," through the Kyles of Bute to East Loch Tarbert, or to Ardrishaig, leaving the Broomielaw at 7 a.m., or Members can travel by rail from Central Station at 8.30 a.m., joining the Steamer at Gourock. Members can also join the Excursion to Crianlarich arranged for the British Institute of Health.
	By the courtesy of the House Committees, the Art Club, Bath Street, and the University Club, Bath Street, were open to all Delegates and Associates attending this Meeting.

MUSEUMS ASSOCIATION RULES.

ADOPTED AT THE LIVERPOOL MEETING.

1.—That this Association be called the "MUSEUMS ASSOCIATION," and shall consist of representatives of the Museums situated in the United Kingdom, and of other persons engaged in scientific work or interested in Museums, who may be admitted as Associates.

2.—The object of the Association shall be the promotion of better and more systematic working of Museums throughout the Kingdom. In order to promote a better knowledge of Museums, the Association shall meet in a different town each succeeding year.

3.—That each Museum contributing not less than one guinea a year be a Member of the Association, and that individuals interested in scientific work be admitted as Associates on payment of 10s. 6d. annually.

4.—That each Museum be represented by three delegates, each having one vote. Each Associate to have one vote.

5.—That each Museum belonging to the Association and each Associate receive one copy of the publications of the Association.

6.—That the affairs of the Association be managed by a Council consisting of a President, two Vice-Presidents, two Secretaries, a Treasurer, and twelve ordinary Members. Three to constitute a quorum. All past Presidents to be *ex-officio* Members of Council. The President, Vice-Presidents, and two ordinary Members of Council to retire each year, and to be ineligible for re-election for one year.

7.—The Council to be elected at the Annual General Meeting, and to hold office for one year. The Council shall have power to fill any vacancies that may occur in its ranks between Annual Meetings.

8.—That a General Meeting of the Association be held annually for the transaction of business, the reading of papers, and the discussion of matters relating to Museums.

9.—The place and time of the Annual Meeting to be determined by the Council.

10.—All new rules, and all resolutions affecting existing ones, to be submitted to the Annual General Meeting. One calendar month's notice to be given of all resolutions affecting the rules.

INTRODUCTORY ADDRESS

BY

MR. JAMES PATON, F.L.S., PRESIDENT.

LET my first words to you be a warm welcome to Glasgow and to Scotland. In your yet brief career you have visited the great capital of the world ; you have been welcomed in the principal industrial centres of England ; you have been the guests of one of our great ancient Universities ; and you have been received with characteristic generosity and warm heartiness in Dublin. After these varied experiences of scenes and cities, the time has surely now fully come when a visit to the land of the mountain and the flood should be paid ; and we here are glad that Glasgow has been selected for the first visit of the Museums Association to Scotland.

Next allow me to offer a word of thanks to the members of the Museums Association for the distinguished honour they have done me in electing me to the presidential chair for this year. When I recall the names of the eminent men who have occupied this position in previous years, it is but natural that I should hesitate to accept the office, and ask if I am not doing a disservice to the Association in undertaking the duties you, with flattering cordiality, bestowed on me. It comforts me to know that there can be no comparison set up between my distinguished predecessors

and myself. Without exception they were men of established reputation and eminence as naturalists ; and into that region of knowledge I have never ventured to penetrate. Conscious of my deficiencies in that and in many other respects, I can only promise to do my utmost to pass on, both office and Association, untarnished in dignity and undiminished in usefulness.

In some aspects it may appear as if the Museums Association has been invited to visit Glasgow prematurely and at an awkward period. Of municipal enterprise and undertaking, in relation to Museum and Art Galleries, we have nothing realised and complete to show you. We do not bring you here to point proudly to lordly halls and bid you wonder at our magnificence. We are in no position to dazzle your eyes, and perhaps excite your envy, with sumptuous ranges of galleries filled with the spoils of all climes and all times. We cannot pretend to teach you any lesson as to new methods of grouping, display, and labelling ; or to give you hints and new ideas as to any detail of Museum arrangement. We have invited you here not to instruct you, but rather to sit humbly at your feet. You find us in that interesting stage in which our schemes, still in the course of evolution, are plastic and capable of modification. We are able to lay before you, on paper chiefly, it is true, a vast and costly Museum ; and in that Museum it is proposed to honour a combination of the arts in a manner not hitherto attempted. The basement of that Museum we shall be able to point out to you as a realised fact, and we can show that complete realisation in stone and lime is now only a matter of time. But all questions of equipment, order, and arrangement, everything that concerns Museum development, everything in which your expert knowledge can be of practical use, are yet undetermined. Here we can yet embody the fruits of the

widest and most varied experience, and here we can try to realise new and hitherto untried combinations. And similarly on Glasgow Green we can show you another Museum undertaking in course of erection, where again there will be a combination of art and nature, of an unusual character. In connection with this institution also there remains open a wide and fertile field for criticism and suggestion. In it we shall be able to test the strength and weakness of a district Museum and Exhibition Gallery, and to discover how best such a local institution can be used for the advantage of the community. The task of giving advice is, at all times, peculiarly pleasing to the giver ; and we invite you freely to exercise that grateful and comforting function.

But while we invite the Museums Association to assume an unaccustomed attitude towards the city it now visits, do not be carried away with the conception that we speak apologetically of our Glasgow institutions. Crops of all kinds ripen slowly in these rigid northern climes. We are not advanced, but we are making preparation and provision for a fruitful harvest. We have on our walls, in our cases, and stored in our cabinets, rich and varied collections from which to furnish forth a whole institution when space shall be afforded us, and it would ill-beseem a town which has been the recipient of many and princely gifts for its Art Galleries and Museums to be other than proud of, and profoundly thankful for, the munificent help of its own children. How these gifts have come, how the Art Galleries and Museums of our city have grown up, let me show you in brief outline.

In this sketch I take cognisance only of the dealings of the municipality with Museums, using the term in its proper and wide signification. It does not fall to me to deal with the original Museum of Glasgow, the famous

Hunterian Museum, which is the property of the University. That institution you will have the privilege of learning about and of inspecting under the guidance of its learned curator, Professor John Young. I confine myself strictly to the dealings of the municipality in relation to the exhibitional institutions of the city.

No Municipal Museum in the United Kingdom, so far as I am aware, can lay claim to an age which carries it out of the range of living memory. Certainly, the circumstances connected with the origin of the Museum of Glasgow are still fresh in the memory of men little past middle life. The beginning of the municipal connection with Museum undertakings was made when, on the 15th May, 1856, the Town Council resolved to acquire the block of buildings and exhibition galleries, in which, much altered, we are now assembled, with the collection of pictures and sculpture which still forms the major portion of the works in this institution. The pictures had been collected and the buildings erected by Mr. Archibald M'Lellan, coachbuilder in Glasgow, and to that gentleman is due the honour and credit of being the real founder of the Art Galleries of Glasgow. Mr. M'Lellan was a man of enlightened public spirit, a town councillor and magistrate, who interested himself in all movements for the beautification of his native city, and for the promotion of art and culture in the community. He was possessed of wide knowledge, catholic sympathies, and keen, critical discrimination in art; and the best part of his life, as well as of his means, he devoted to the accumulation of the remarkable collection of pictures and other works of art he left behind him. The M'Lellan collection was formed during the second quarter of the present century, at a time when the value and permanent importance of the productions of the great masters were recognised by very few, when it was not yet the fashion to

patronise Rembrandt, Rubens, and Raphael, and when it was quite unnecessary for the reputation of culture to talk glibly of Botticelli, and the Bellini. Pictures could at that time be acquired by others than millionaire stockbrokers and companymongers; and it is to the credit of M'Lellan that he could recognise the true value and the enduring charms of works of art though they were neglected by dealers and scorned by the crowd.

It was the ambition of Mr. M'Lellan to establish in Glasgow a gallery of art for the benefit of his fellow citizens, and to bequeath and dedicate it for public use at the time of his death. With this view, in connection with the erection of the block of shops and dwelling-houses facing Sauchiehall Street, he had three exhibition saloons or galleries thrown out to the court behind. While these buildings were in progress in November, 1853, Mr. M'Lellan, being yet under sixty years of age, executed a deed of settlement, the introductory clauses of which express the purpose of the testator. It proceeds—

I, Archibald M'Lellan, coachbuilder in Glasgow, considering that I have, for thirty years, spent much of my spare time in making a collection of pictures illustrative of the characteristics and progress of the various schools of painting in Italy, Germany, Spain, the Low Countries, and France, since the revival of art in the fifteenth century; and that, imperfect as any such collection formed by a private individual must necessarily be, it still may be of some use to those who are desirous of studying the progress of art; and also believing that it may be made to form the foundation for a more extensive and complete collection, through contributions from those who have more means and better judgment to select fine examples of the respective schools, and being impressed with the belief that the study of what are called the "Fine Arts" is eminently conducive to the elevation and refinement of all classes, as well as intimately connected with the manufacturing and mercantile prosperity of the community, from these various motives, and on account of my long

connection with Glasgow and its various public bodies, and as a humble testimony of my attachment to its citizens, and my desire for their welfare and elevation, so far as it is in my power to aid in the promotion of these, I have resolved to devote my said collection to public use and exhibition, and to make the same over for that purpose to trustees, who shall have the sole control and management thereof.

He then proceeds specifically to bequeath his collection "for behoof of the citizens of Glasgow in all time coming to the Lord Provost, the Dean of Guild, the Deacon Convener," and to other holders of office with three nominated Trustees, and he enters into minute details as to the conservation and treatment of works, the maintenance of a pure atmosphere and equable temperature around them, the number of visitors to be admitted at any one time to the saloons, the conditions under which further gifts to the gallery may be accepted, and other points. The bequest, moreover, included the three saloons specially erected for receiving the pictures, and the trustees were empowered, should the rooms become from any cause unsuitable, to sell the structure and remove the collection to another and more advantageous situation.

The document is obviously the work of a man of delicate and refined taste, imbued with a high appreciation of the mission of art, modestly proud of his achievements, and not without some suspicions as to the possibility that his treasures might not be so carefully guarded by their future custodians as by himself. Mr. M'Lellan's life labour and his testamentary deed afford another illustration of life's little ironies. On his premature death, within a year after executing the deed, it was found that his affairs, through his building scheme, and probably also his passion for pictures, were so involved that it was impossible at once to satisfy his creditors and carry into effect the purposes of his trust. Under the circumstances the Town Council,

after much negotiation and amid a storm of opposition, agreed to purchase the entire block of buildings, with the three saloons and the collection of pictures, for the sum of £44,500—being £29,500 for the buildings, and £15,000 for the pictures. In passing, it may be remarked that a single picture might be selected from the collection which, exposed for sale at the present moment, would nearly, if not altogether, cover the sum paid for the entire collection.

In this way the Town Council, in May, 1856, became somewhat reluctant patrons of art, and the owners of an art gallery rather against their will. The circumstances associated with the transference were not without their compensations. Had M'Lellan's will been carried into effect, the Town Council would have had little concern with and no responsibility for the gallery he bequeathed to the city. It would have been in the hands of a semi-private but shifting body of trustees, without endowment for its adequate administration ; and, probably, after a brief spasmodic burst of public gratitude and admiration, it would have declined into a mouldy and melancholy condition of neglect, visited chiefly by spiders and their unwary victims.

As it was, the Council were by the purchase left with an entirely free hand and unfettered control of the property. They had the right to sell the pictures if they so willed, and they were also entitled to use the halls and buildings for any purpose they deemed proper. Of both these rights they subsequently took advantage ; more than once sales were made of pictures weeded out of the M'Lellan Collection, while for many years the galleries were used for all manner of revenue yielding objects other than art gallery uses. But the important fact remained that the structure and collections were public property, and a time did come when both Council and public fully realised the high responsibility of the charge they had undertaken, and the

incalculable value of the collection they had acquired. Within a month after the purchase of the collection an enlightened citizen, Mr. William Euing, in redemption of a pledge he had given conditional on the completion of the bargain, presented thirty works selected from his own gallery, to the collection. Many years later (in 1874) the remainder of Mr. Euing's pictures were added by bequest, and now form a notable feature in the general collection. Mr. Euing bequeathed at the same time an extensive and unique collection of editions of the Holy Scriptures to the University of Glasgow, and a most valuable musical library and collection of musical instruments to the Anderson's College, in which also he founded a chair of music.

About the year 1867 private tenants, excepting the occupiers of shops, were displaced from the M'Lellan property, and a certain amount of reconstruction was undertaken to adapt the upper floors to public purposes. The whole of the eastern section over the shops was appropriated to the School of Art. In the western section the upper floor was transformed into galleries and exhibition halls; and on the first floor was found accommodation for the libraries and committee rooms of the Philosophical Society and the Institution of Engineers and Shipbuilders, with a lecture room *en suite*. These alterations were undertaken principally on the recommendation of Mr. C. Heath Wilson; and, while the changes still left a large proportion of the property rent-yielding, they added greatly to the accommodation for the exhibition of pictures. The whole cost of the structural alterations was less than £4000, so that the capital expenditure on both pictures and buildings remained considerably less than £50,000.

It must be borne in mind that the original Galleries, and

their extensions also, were equally regarded by the Council as rent producers, and from the first the halls were let to private applicants for a great variety of purposes, such as public lectures, balls, concerts, bazaars, and other similar entertainments. These applications of a gallery of art were manifestly inconsistent with its proper use as a public institution ; but the whole matter was looked at in the early days merely as a question of investment, and in that sense it was not a success. From 1862 onwards, the Glasgow Institute of Fine Arts was a tenant for its annual exhibitions, and for many years these exhibitions were the only real artistic use to which the Galleries were devoted.

At the time the extension of the Galleries was undertaken, a spasmodic effort was made to place the collections and the public relation to them on an improved footing. The new Galleries were inaugurated with an exhibition of local historical portraits, and a collection of extreme importance for the illustration of the history of Glasgow and the West of Scotland was brought together, of which a most valuable catalogue was prepared by Mr. Heath Wilson. The exhibition, however, was a pecuniary failure, and on Mr. Wilson resigning the curatorship of the Galleries—an office he held for a short period only—a decreasing interest was manifested in the institution, and it gradually fell into the most regrettable and detrimental condition of public neglect. The landlord attitude of the Town Council came indeed to overshadow and crush out all other relations and responsibilities, and the M'Lellan pictures and other art property which had been added by gift and bequest were regarded as mere ornamental adjuncts—sometimes it is to be feared as unwelcome incumbrances—to balls, concerts, bazaars, and dinners, for which the halls were hired and used. It can scarcely be wondered that under such a

course of treatment the pictures fell into disrepute, people began to doubt whether they were even ornamental, and their presence was regarded as a hindrance to the free use of the halls for miscellaneous purposes.

In the face of these very untoward conditions the institution continued to receive from time to time bequests and donations of important pictures and of collections of great value. In April, 1877, there was submitted to the Town Council an excerpt from the will of Mrs. Graham-Gilbert of Yorkhill in the following terms:—

I direct my trustees to deliver over the following specific legacies, and that within six months after my decease, free of legacy duty or expense of discharge, viz., to deliver over to the Lord Provost, Bailies, and Council of the City of Glasgow for the time, such of the paintings in oil (under the exceptions after mentioned) as may be in Yorkhill House at the time of my death, and as they may select, under an obligation to preserve the same in trust for the Corporation of the said City and for being exhibited to the inhabitants thereof; also the marble statue of my late husband by Brodie of Edinburgh, and which paintings in oil and statue shall be preserved and placed by themselves in one room in the M'Lellan or any other Gallery belonging to the said Corporation, and bear the name of John Graham-Gilbert, and also at the same time to pay to the said Lord Provost, Bailies, and Council of the City of Glasgow for the time, the sum of two hundred pounds sterling, for the purpose of framing or otherwise putting in order the paintings which they may select as aforesaid specially excepting from the said paintings in oil, from which selection may be made as aforesaid for the City of Glasgow, the portraits of my uncle, my mother, my sister, and myself, all which shall remain at Yorkhill House, and be the property of the heir of entail for the time being of the estate of Yorkhill.

Mr. John Graham-Gilbert, R.S.A., originally John Graham, who assumed the surname of Gilbert when his wife succeeded to the estate of Yorkhill in the City of Glasgow, was a much and deservedly-esteemed artist, who devoted himself chiefly to portrait painting. He had throughout his whole

career taken a keen interest in the promotion of art in the West of Scotland ; and he had an unfailing zeal for, and belief in the value of, the Corporation collection. Possessed of ample means, Mr. Graham-Gilbert followed the example of M'Lellan in forming a cabinet of works of the old masters, and he was fortunate in securing several works which are now esteemed among our greatest treasures. Mr. Graham-Gilbert died in 1866 ; but with commendable propriety he left it to his wife, through whom his wealth came, to deal with his art accumulations according to her own will. The Graham-Gilbert bequest, as selected and handed over to the Corporation, included 70 original works principally by Dutch and Italian masters, 40 pictures by himself, and 27 copies and studies he had made from well-known pictures by old masters.

The reception of the Graham-Gilbert bequest was an epoch and turning-point in the history of the Galleries. A new and proper view of the functions of the institution was taken by the Town Council ; and the duty they owed at once to the public, and to the generous donors of works of incalculable value, was now recognised. Thenceforward the resolute policy of the Council was to render the collections properly available and useful to the community, and to rehabilitate the sadly tarnished reputation of the works of art which, for more than twenty years, had been neglected and contemned. But, alas ! of all reputations the reputation of a picture is most easily soiled ; of all virtues its virtue is the most fragile. In matters of art, as well as in questions of theology, the public take their opinion from their masters, and, with unsparing measure, they heap buffets and insults on what they find neglected and depreciated by their leaders. The greatest triumphs of Raphael or Rembrandt would come very badly out of twenty years of obloquy, and a few well-directed and

persistent sneers would work havoc with the reputation of the Tribune in Florence, or the Salon Carré in Paris. The Town Council of Glasgow had to repair the injuries of many years ; not only had they the arduous task of re-establishing a lost reputation, but they had also to reckon with the material injuries which result from a long course of ignorant and careless treatment, from alternate exposure on walls and storing in closets, from all the variations of heat and cold, damp and dry air, light and darkness ; from the very evils against which poor M'Lellan had warned his trustees and sought to guard his beloved works.

How the task was faced and accomplished it would take too long to tell ; but in the end a large measure of success attended the various efforts to popularise and to win public respect for the collections. First there was a careful weeding out and separation of pictures which from any cause had become unworthy of the collections ; then a catalogue was prepared and published, in which only the works selected as worthy of permanent retention were entered. To make Glasgow people believe in the value of their own property the opinion of experts of standing from a distance was obtained and published to them. The Galleries were strictly reserved for their legitimate uses ; the public bodies who had acquired a settlement within the walls were gently but firmly dislodged, and all miscellaneous banquets and balls were prohibited. The pictures were treated with due respect, they were freed from accumulated dust and discoloured varnish, their frames were repaired, and they were glazed over to preserve them from the evil influences of our acid-laden atmosphere. Some of the rarer and more precious works were from time to time lent to the Winter Exhibition of the Royal Academy, and to other special exhibitions in London and elsewhere, and thereby they obtained a reputation as wide

as it is enduring. The Corporation, out of the rates, as opportunity offered, purchased other works of an attractive nature which served to enrich the Galleries and to add new interest to the whole. Courses of popular lectures were organised, mainly with the view of increasing the popular knowledge and appreciation of the Art Collections ; these proved a most gratifying success, and they are now one of the most valuable features of the work of the supervising Committee.

It may be claimed that the efforts of the Corporation to rehabilitate the collections and re-establish their fair fame have been completely successful. Much remains yet to do ; but the Glasgow Gallery now takes its place in the front rank of such institutions, and the Glasgow collection has to be taken into account in estimating the art heritage and wealth of mankind.

No better testimony to the esteem and confidence in which the Galleries are held can be cited than the fact that within the last few weeks there has been given to the collection a gift of ten modern pictures, which, within the past few years, cost their original purchaser almost £23,000. Bequests to that extent are of exceptional occurrence ; but a free gift, and that from young men, of property so valuable is rare enough to be a phenomenon ; and the fact that the Messrs. Reid of Hydepark Locomotive Works took this way of honouring the memory of their father, Mr. James Reid of Auchterarder, is a noble testimony to their filial piety, their splendid generosity, and their local patriotism.

I have dwelt so long on the vicissitudes of the Corporation Art collections that I have left but little time to deal with the other phases of municipal Museum enterprise. Therefore "Let us haste to Kelvingrove." In that park, the name of which is enshrined in classic Scottish song, you will find a small Museum which, for the present and for

many years past, has been a store place rather than a Museum ; and near it are rising the walls of what is to be the future central Art Gallery and Museum of the city. The small Museum was begun in 1870 under the name of the City Industrial Museum, within the mansion-house of Kelvingrove, after that building had undergone such structural alterations as were required. It was a humble enough affair ; but are not all right beginnings small and to the eye weak ? It received little attention at first from the Council, but it became wonderfully well liked by the people, and its collections grew apace. In 1874, with the sanction of the Council, the hat was sent round among local manufacturers and the benevolent public, from whom nearly £8000 was received for building an addition to the tiny Museum, and to that sum the Council added a contribution of £700. That this sum was spent on attaching a wing to Kelvingrove House may be a matter for regret, for the site was not well chosen, the necessities of the building were not considered, and the amount was altogether inadequate for providing the Museum space required for a city like Glasgow. But the building was proceeded with, and in 1876 the extension was ready for occupation. The City Industrial Museum was, from the very first, not an Industrial Museum, if by that name is meant an institution purely technological in character. It was more a Natural History Museum or an ornithological collection, for its first curator was an enthusiastic lover of birds. But, indeed, it was all-embracing and indiscriminating in its receptivity, and accepted with equal gratitude oil pictures and South Sea war clubs ; ship models and live snakes ; collections of birds' eggs and illustrations of the manufacture of Tam o' Shanter bonnets ; in fact it was everything by turn—industrial, artistic, biological, archæological, and ethnological—but necessarily not very much of anything.

With this omnivorous appetite for Museum specimens there was nothing wrong, but an ambitious programme demands a spacious field in which to display its details. It was painfully obvious from the very day the extension was opened, that its capacity was quite inadequate for illustrating the circle of the sciences and the activities of the human race. The additional space obtained in the new erection was no sooner available than it was fully occupied, and by all concerned it was recognised that the Museum problem in Glasgow yet remained to be solved.

Till this time the Town Council had little real responsibility in connection with the Museum undertaking. The Parks Act, passed in 1859, constituting the Parks and Galleries Trustees, recognised the existence of the art collection purchased from M'Lellan's executors, and sanctioned its maintenance; but that statute made no provision for extensions, nor for the acquisition and maintenance of any further Museum institution; and it was not until 1878 that the construction and maintenance of Museums by the Council out of the Park's rates were rendered legal and statutory. In the Glasgow Public Parks Act of that year, full powers were given to the Lord Provost, Magistrates and Council, in their capacity of Parks and Galleries Trustees, to maintain already existing Museums, and "from time to time to erect, fit up, furnish and maintain such new and additional buildings for Museums and collections of Natural History, Science and Art, as they may deem it expedient." By this enactment the Town Council for the first time definitely acknowledged their responsibility for the Museum interests of the city, and by implication they undertook their adequate development.

The Council, with power "from time to time to erect and fit up" Museum buildings, had from time to time various schemes under their consideration without arriving at any

final decision ; but all these, more or less matured or advanced, were only serving to educate public opinion and to keep the question well before the community. Meanwhile, the Kelvingrove Museum, steadily in receipt of varied and valuable additions by gift and otherwise, became more and more a storehouse in which classification was necessarily disregarded, and the utmost attainable was to keep, as far as possible, the collections under inspection. A certain amount of relief was obtained by transferring to the Corporation Galleries such portions of the accumulations as had a distinctly artistic side — the art pottery, the glass, metal work and such ; but that did not diminish the confusion, while to some extent it interfered with the proper display of pictures around the Gallery walls.

The occurrence, more than once, of outbreaks of fire in connection with the shops and other tenancies in the same buildings as the premises, had a powerful influence in stimulating the energies of the Corporation in the direction of acquiring a safer and more fitting home for their art treasures. Early in 1886 the suggestion was made that at least the nucleus of a building might be obtained by the organisation of a great temporary exhibition in Kelvin-grove Park ; and with the sanction of the Town Council, the Museum and Galleries Sub-Committee set themselves earnestly to outline the conditions of such an undertaken. How the work of organising that exhibition was carried forward, and what success attended it are questions which do not concern us. The object the Museum Committee had in view is thus concisely stated in their annual report for 1886 :—

Among the motives which impelled the Committee to take action in the matter was the expectation that the Exhibition might prove a financial success, and leave at the close a large balance of

profit which could be most fittingly disposed of by being devoted towards providing permanent buildings for the Municipal collections of Science and Art. In that view the Executive Council of the Exhibition have coincided, and in the Articles of Association it is provided that any surplus which may arise in connection with the Exhibition "shall be applied in or towards erecting, equipping, and maintaining a Gallery of Art or a Museum of Science and Art, or otherwise in promoting Science and Art in Glasgow in such way and manner as shall be determined by the members of the Exhibition Association, at or before the time of dissolution thereof, or in default thereof, by the Magistrates and Council of Glasgow."

The Exhibition was held during the summer of 1888, and its financial success far exceeded the expectations of its original promoters. When all accounts had been adjusted it was found that there remained on the hands of the Exhibition Association a clear surplus of £46,000, a fat carcase around which many hungry vultures immediately began to scream. The sum, however, was both well secured and well defended ; and the Association, instead of resting content with the gratifying outcome of their labours, in a most patriotic manner offered to undertake the task of at least doubling the amount by public subscription. In an agreement with the Town Council it was stipulated that should the Exhibition Association be successful in raising the available fund to not less than £92,000, the Corporation should grant a sufficient site free of cost in Kelvingrove Park, on which to erect a Museum and Art Gallery building ; and that the administration of the fund, the adjusting of the scheme of building, the selection of an architect, and the execution of the work should devolve on an Executive Committee elected in the proportion of two-thirds from the Corporation and one-third from the Exhibition Association. On the completion of their task the Executive Committee was pledged to transfer the buildings *simpliciter* to the Corporation.

These and other conditions of minor importance being agreed to, the Exhibition Association, under a new name—"The Association for the Promotion of Art and Music in the City of Glasgow"—proceeded with vigour to carry out the first part of their undertaking—the raising of subscriptions for the building fund. Within the prescribed time—twelve months—they had gathered considerably more than the minimum £46,000 to which they were pledged. In consequence they were now in a position to claim a site in Kelvingrove Park and to proceed with the structure. As the result of a public competition, the plans submitted by Messrs. Simpson and Milner Allen of London were, in June, 1892, on the advice of Mr. Alfred Waterhouse, R.A., selected. The architects' estimate for the completed building was £154,398, or, leaving two quadrangles uncovered, £119,775; the less sanguine local surveyors put these figures at £170,320 and £130,450, and we shall find that even these larger amounts were far within the sums asked by the lowest offers for the work. But with £113,000 in hand, and subscriptions still coming in, the Executive Committee considered themselves well entitled to go on with an erection which they were assured would cost only £120,000, and accordingly contracts for the basement were issued. No doubt the executive were a little staggered when they found that the estimate for this preliminary section, accepted in June, 1893, amounted to £22,225, and in the end it actually cost £2000 more. Tenders for the superstructure were invited in June, 1895, when it was found that the entire cost of the structure, including basement, would be £198,420 if finished with oak and internal stone work, or omitting the two courts and finishing in pine and plaster the expenditure would amount to £154,000. The whole sum from beginning to end at the disposal of the Executive Committee did not exceed

£127,900, made up of exhibition surplus with interest, £53,550, and subscriptions with interest, £74,350. The Committee found themselves in the awkward position of having spent almost £28,000 in connection with a building which, to carry forward and leave only partly finished in a second-rate manner, would cost nearly £27,000 more than they were possessed of; while to complete the structure in a worthy manner would demand the expenditure of upwards of £70,000 beyond their resources. The flow of subscriptions, as is the habit of such flows, dwindled from the very first and had long ceased; public charity had been directed into new channels, which are always being dug in a great city for the capturing of that coveted stream, and new enthusiasms had taken possession of the giving community. In their dilemma, the only course open to the Executive Committee was to lay their case simply before the Town Council, asking that body either to guarantee the funds necessary for the completion of the buildings, or to take over the work done, the funds on hand and the obligations, and deal with the building themselves. The latter alternative the Town Council accepted. They associated with the Building Committee they nominated—which Building Committee is the Sub-Committee for Museum and Galleries—certain members and officials of the Executive Committee; they accepted estimates for completing the building in the best manner, and now the work is again in progress.

Among the multifarious activities of the Museum Committee during the past fifteen years, the holding of special and of local or district exhibitions has occupied a prominent place. With the special exhibitions held in these galleries such as the Exhibition of Oriental Art, of Italian Art, and of French Art, we need not now concern ourselves; but the district exhibitions offer certain phases of interest, and

have had an outcome which merits attention. In all towns there is a show quarter in which the public offices, the great buildings and monuments, and the attractions generally are more or less concentrated. And away from these—in the case of great cities sometimes very far away—there are interminable rows of monotonous dwelling-houses, relieved only by the dull-looking churches which struggle not quite successfully with the rival whisky shops at the street corners. Moreover, in a town like Glasgow there is a tendency for the population to segment itself; for the east-end to distinguish itself from, and in some measure to be opposed to, the west-end; and for the south side to look on the north side as unduly favoured by both Providence and the Town Council. The people dwell in their own quarters, and, notwithstanding the facilities of communication, many in one extremity or suburb are as little acquainted with the opposite extreme as they are with the capital of Thibet. They demand institutions for themselves; there are reasonable grounds for their claims, and these have been sympathetically treated by the Museum Committee. In 1883 they organised a local exhibition of pictures and miscellaneous art objects in a small hall attached to the Police Buildings in the eastern district of the city. The novelty and the unexpectedness of the undertaking rendered it a great success with the local population, and during the time it was open, three months, from February till May, 1883, it was visited by 63,500 persons. Following on this, at the end of the succeeding year a similar exhibition, on a much more extensive scale, was organised in two large halls, also the property of the Police Commissioners, in Main Street, Gorbals, on the south side. This exhibition which was, in three months, visited by 153,000 persons, was the first of a long series continued at intervals till 1891, after which the hall was let

by the Commissioners for manufacturing purposes. In that year, 1891, it was the desire of the Committee again to provide an exhibition for the eastern district, and a Sub-Committee was appointed to look out for a suitable hall or building. A survey of the whole district failed to discover any sufficient place, and on making report to this effect, a Special Committee was constituted to consider the question of providing an exhibitional building in the eastern district with such adjuncts as might properly come within the scope of the Parks and Galleries Trust. For the cost of the erection of such a building it was found that several small funds were in existence on which the east-end had a special claim, which altogether might amount to something over £20,000, but it was not at first contemplated to expend such an amount. A considerable time was spent in arriving at an understanding as to the precise scope of the institution suited for, and satisfying to, the district ; and I am afraid to venture a guess at the number of sets of plans my good friend, Mr. M'Donald, the City Architect, was called on to prepare and submit. In the end it was agreed that the People's Palace should be planted on Glasgow Green, and that it should take the form of a Museum and Art Gallery Building, two stories in height, with a great winter garden of glass attached, the whole to cost a little more than £20,000, and that project is now in the way of realisation.

And now we come to the latest of the undertakings of this most active and enterprising Committee. The letting of the halls in the Gorbals had deprived them of the use of that structure for district exhibition purposes, and appeared to bar them from continued activity on the south side. But, two years ago, the Corporation acquired the grounds of Camphill as an addition to the Queen's Park, and included in that

purchase was the fine mansion-house of Camphill, which was vacated in the early part of July last year. From the very first the Museum Committee had their eyes on the house for the purposes of a District Gallery; and when it was found that the public rooms could be adapted for such use at a trifling cost, they had no difficulty in obtaining the consent of the Corporation for its appropriation. And so Camphill was taken in hand, the few structural alterations required were carried out, a special photographic exhibition was organised for the inauguration of the first permanent District Gallery, and that statement brings us to the position which the Museum Committee at this moment occupies in the discharge of its duties towards this great and needful community.

And why should Corporations trouble themselves with such things? Here—will you let me confess it?—I have come to the subject of my discourse, and all I have said was primarily intended to lead up to the theme—the relations of municipalities, or, broadly, of rate-levying bodies to Museums and the sanction for devoting rates to the support of such institutions. But it is evident that a subject which demands, or can bear, such a lengthy introduction, cannot itself be adequately dealt with in the few minutes I dare now bestow on it. It is worthy of more respectful treatment than to form a mere tag on the end of a dry narrative, and I must leave it to be taken up at length on some future occasion.

The support of Museums by municipal authorities we may at once confess had not the sanction of long established use and wont, nor does the care of such institutions fall within the first line of the obligations of a Town Council. First and foremost, now as at all

times, stands the duty of watching and warding, as it is termed in our ancient charters and statutes—the duty of the policeman as we interpret it in these days. The primal duty arises out of a too well-grounded distrust of our fellows ; out of the necessity that rests on a community to provide for the security of the persons and property of its constituents. And with grief we have to confess, in this year of grace 1896, a prison is a more fundamental requirement of a great community than an Art Gallery. Here the municipality have to deal with the meaner instincts and criminal cravings of the race. Next in order come the multifarious duties which arise in connection with cleanliness and health, what we may term the scavenging functions—the providing of water, and inducing and compelling the populace to wash themselves and their clothes, the construction of sewers, the provision of hospitals for infectious diseases, and the securing of parks and open spaces for the healthy life and recreation of the people. Here we are on a higher plane ; but still in the main the duties are compulsory, and arise out of a distrust of the instincts of mankind in relation to cleanliness, and out of a selfish fear of smallpox, cholera, and fevers. Having by these agencies kept our citizen honest, clean, and healthy, we now still with some selfish leaven seek to fit him for the duties of a citizen, and he is turned over to the School Board to be educated at the ratepayers' expense. But more than a citizen, he must be a tradesman ; and his own welfare and the industrial prosperity of the nation depend on his industry, expertness, and skill ; and here with the technical school comes in the first function of the Museum—to afford information, suggestion, and stimulus to the artizan, the designer, and the inventor. With the next step we get out of the region in which

action is impelled by motives of selfishness or fear, and we deal with our fellow-citizen not as a tradesman but as a man. The whole world of accumulated knowledge and art, all the garnered stores of time are the heritage of the race, and our libraries, our museums of natural history, our botanic gardens, our collections of archæology and ethnography, and our art treasures are not merely, I should say not chiefly, for making skilled and informed tradesmen, but for cultivating the higher faculties of humanity. But there is still a higher reach, and in the picture gallery dealing with the grand achievements of human genius we attain the very summit of municipal endeavour. Here in the House Beautiful there is no thought of rearing craftsmen, nor even of communicating useful knowledge; the aim is higher and holier; it is to minister to the pure enjoyment of the people, to give them pleasure and delight, pleasure in which there is no after-taste of bitterness, and delight which increases with growing experience. I do not need to demonstrate to this assembly which duty is the more noble—that which is the outcome of fear and selfishness, or that which proceeds from brotherly love, and a desire that the good things of this life should be shared by all. The institution, the care and development of museums and art galleries, of libraries, and science and art institutions, I maintain is the noblest work which falls to the lot of any municipality; and it will be a happy day for our cities when the police rates begin to fall, when our prisons become deserted, when our Parks, Galleries, and Libraries' rates rise, and when these places swarm with instructed, happy, and appreciative citizens.

THE ARRANGEMENT OF THE PERTHSHIRE NATURAL HISTORY MUSEUM.

I.—THE PERTHSHIRE COLLECTIONS.

BY HENRY COATES, F.R.S.E.

IN bringing the Perthshire Natural History Museum under the notice of the Museums Association, we do so not in the hope that we can teach the members anything new with regard to Museum arrangement, but simply in order that you may be better prepared to examine the collections when you visit Perth on Friday afternoon. The only merit which we claim for our Museum is that it was founded with a definite idea in view, which idea we have endeavoured to carry out in every detail of the arrangement. The general principle on which we have worked was laid down for us by the late Dr. Buchanan White in his inaugural address as first President of the Perthshire Society of Natural Science. In that address, delivered on 7th March, 1867, he said—"As regards the formation of a Museum, the Society, while not neglecting to form a good general typical collection, should more especially devote itself to the acquisition of as perfect a Museum as possible of all the natural products of the county. . . . In the meantime each member might easily collect and lay aside specimens for the Museum, and thus, when we obtain a suitable receptacle, we shall have the nucleus of a collection." I have been particular

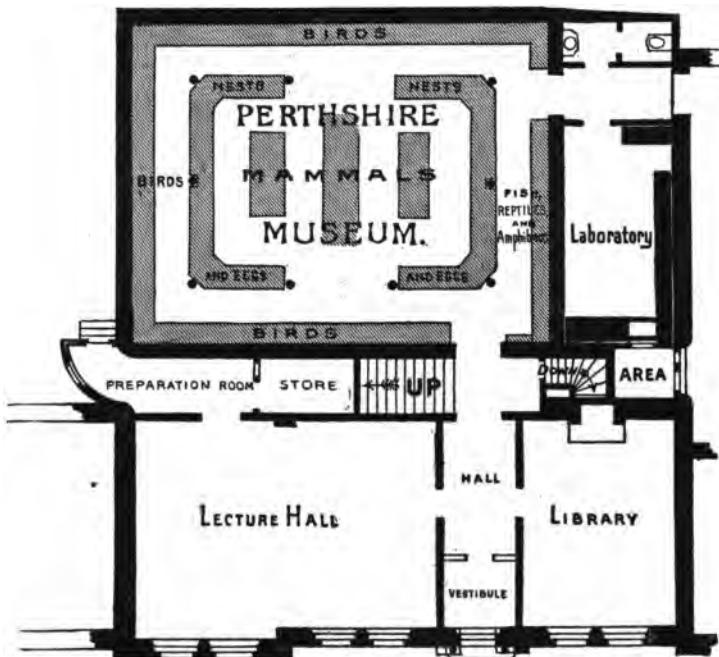
to mention the date—nearly thirty years ago—at which these words were uttered, as the principles laid down were not then recognised as they are now.

For the first fifteen years the work of the Society was confined chiefly to the collecting of both facts and specimens bearing on the natural history of the county. The task of arranging these in systematic order had to be deferred until the “suitable receptacle” was provided. The first step towards supplying this want was taken in 1881, when the older portion of the present building was erected. This consisted of Library, Lecture Room, and Work Room on the ground floor, with Museum Hall above, and fulfilled its purpose well so far as it went. Soon, however, the Museum Hall became uncomfortably crowded with specimens, and, in addition, presented the fatal objection that the two series of collections—the Perthshire and the Index—could not be kept sufficiently distinct from each other. A new Museum Hall was therefore erected at the back of the original building, for the purpose of being devoted exclusively to the Perthshire Collections. It was this new building which was formally inaugurated by Sir William H. Flower on 29th November last.

Such is a brief outline of the evolution of our Museum. I will now indicate equally briefly the way in which the Perthshire Collections are housed and arranged, after which Mr. Rodger will explain what has been done, and is still to do, with regard to the Index Collections.

The new building is a rectangular hall, 44 feet by 34 feet, lighted from the roof, and with a gallery running round the four walls. The ground floor is devoted entirely to the vertebrata, the mammals being contained in three tall cases in the centre; while the birds, fishes, amphibians, and reptiles are arranged round the walls. Between these

two sets of cases runs a third set, containing the birds' nests and eggs. The Ornithological Collections, which are as nearly complete as possible, were brought together mainly through the labours of the late Colonel Drummond Hay, and are in a perfect state of preservation. The deer (red and roe) occupy the large central case,



PLAN OF GROUND FLOOR

and are arranged in a natural group, with a groundwork of rocks and heather. The other mammals are arranged on glass shelves in the two remaining upright cases. The majority of the nests are mounted with their natural surroundings, great care having been exercised by Colonel Drummond Hay to ensure that these are true to nature.

This applies more especially to the ground nests, most of the tree nests being simply supported on light wire stands. The birds, which fill the wall cases on three sides of the building, are arranged on adjustable glass shelves. The backs and fittings of the cases are painted a very pale blue tint.

Among the fishes the salmonidae are represented by a fine series of coloured casts, as well as preparations in a four per cent. solution of formalin, while the life-history of the salmon is shown in detail.

Above the wall cases, and under the gallery, is a series of large geological diagrams painted directly on the wall. These represent sections through some of the more characteristic portions of the district, and are drawn to scale, the altitude being, of course, exaggerated in proportion to lateral scale. A colour key is painted on the wall at the eye line.

In the gallery are the invertebrata, and also the Botanical and Geological Collections. The land and fresh-water shells, which embrace all the species known in the locality, are exhibited in desk-cases along the north side. Opposite to these, in wall-cases of special construction, are the various orders of the insecta. These cases consist of an upper portion for exhibition purposes, and a lower portion for storage. The former has a glass front, sloping at a high angle, and a false back with a corresponding slope, against which are placed large glass-topped boxes. By this means the specimens are all placed at a convenient angle to the line of vision, and none are either too high or too low to be easily examined.

The Botanical Collections are displayed in the south and west galleries. Of the phanerogams, each genus is represented, the specimens being exhibited in shallow wall-cases. At the beginning of each order is placed a

small coloured diagram giving the morphological characters. On the west wall is a complete series of the indigenous trees of the county, each species being represented by longitudinal and transverse sections, bark, seed, seedling, leaves, flower, and fruit, and also, as far as possible, by photographs showing summer and winter conditions. The cryptogams are exhibited in desk-cases along the fronts of these two galleries, the most complete of the series being the mosses, which are mounted on mahogany tablets, covered with French-grey paper.

The remaining gallery, namely that on the east wall, is devoted to the Geology of the County. The Petrological and Mineralogical Collections are displayed in sloping wall cases, similar to those containing the Insect Collections, excepting that the specimens are arranged on narrow adjustable wooden shelves, lying at right angles to the sloping false back. The specimens lean against the latter in a nearly upright position, thus obviating the necessity of supporting blocks. The descriptive labels are fixed to the front ledge of the shelf. The highest portion of the case is devoted to maps, diagrams, and photographs.

The three desk cases in the Geological Gallery are devoted respectively to (1) the fossils, (2) the soils, and (3) the rock structures of the County. The examples of soils are chosen so as to exhibit the various stages in the disintegration of the rocks, and are displayed in glass-topped boxes.

The general Botanical Collections, which contain the whole of the late Dr. Buchanan White's plants, are contained in a separate Herbarium room.

II.—THE INDEX OR TYPE COLLECTIONS.

BY ALEX. M. RODGER.

IN this short paper I do not propose going into the various theories as to what an Index Museum ought to be, but I mean simply to put before you a few notes of a scheme, on the lines of which I propose to lay out our Type collections in Perth.

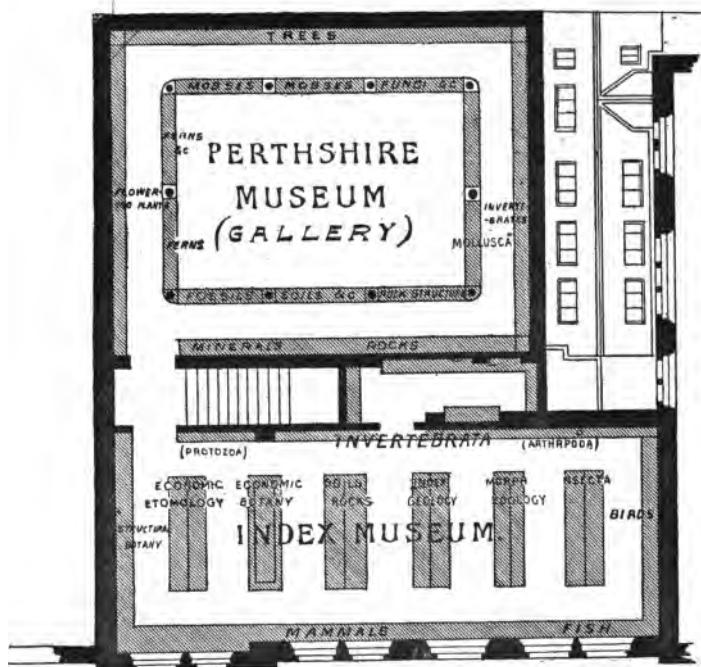
The museum was previously fitted up so as to display a Type collection side by side with a Perthshire collection, illustrating local Geology, Botany, and Zoology; and the cases then were planned and adapted for that purpose. But now that we have a Perthshire Museum, and are about to make an index collection separate from, and subordinate to, it, it was thought that an idea of its proposed arrangement would be an acceptable paper for this meeting, in order that the gentlemen who intend to honour us with their presence in Perth might give us the benefit of their experience in this direction.

On the plan you will see the arrangement of the cases, and amount of floor space, drawn to scale. On the west wall runs a long case, the depth of which is 9 ins. Here I have placed our invertebrata, beginning with the Protozoa, and working up to the Arthropoda. In a flat case at the end, I intend giving special prominence to the Lepidopterous insects. On the north wall the case is 1 ft. 9 ins. Here are arranged the birds; while the east wall is devoted to the fish and mammals. The reptiles and amphibians are on the inner side of the first tall case.

On the south wall the case is 1 ft. 9 ins. in depth, and

well suited for Morphological Botany, that is to say, for preparations and models illustrating the leading features of the structures of plants.

The wall cases, it will be seen, will give us our specimens in sequence, a point much to be desired in a museum.



PLAN OF FIRST FLOOR

The first flat case I propose in time to be for the display of a series of entomological specimens, showing the relation of insects to agriculture. The first tall case will be devoted to Economic Botany, illustrating such points as the structure of cereal plants or fruits, vegetable products used in the arts, parasitism, etc.

The second flat case will illustrate geology in relation to agriculture, the chemical composition and geological relation of soils, and so forth.

These four cases taken together would give us, I think, a series, though small yet well adapted for class work.

The remaining flat case is destined to contain our mineral collections which are ample for a student.

Lastly, I propose to devote the remaining upright case to vertebrate animals, with special regard to morphological and biological problems. We may illustrate here, in course of time, the homologies of various organs, the leading features of development, the relation of colour to environment, to seasonal change, to love of beauty for beauty's sake, the methods of protection and attack, the cardinal features of geographical distribution, and other general topics which may, as time goes on, suggest themselves.

And now I have said all, or nearly all, I need say regarding our Index Museum.

There are one or two points I would like to bring before you and then I have done.

First, *The Cost of an Index Museum*.—There is no definite rule or measure of its cost. We may be content with little, or our ambitions may extend to much. The scale on which we erect our Type collections will depend on our means and opportunities. But what I want to remind you of from the first is simply this, that our Type collection may be very small, and yet highly valuable for instruction, while it might conceivably be very large and costly and have very little teaching value indeed.

You may have a Type collection for £5, and with it you can satisfactorily illustrate the animal kingdom with, say—

A model of an Amœba.

Sea Anemone.

Worm.

Skeleton of a Haddock.

”	”	Frog.
”	”	Adder.
”	”	Pigeon.
”	”	Rabbit.

But then in a growing museum one is not content to rest with a single species to represent each class. As in one's education, we begin by easily obtained types, and in time we add round these types closely allied forms, so we begin to arrange alongside our first types, closely allied forms; say, passing on from the anemones, we want to show their relation to the corals with their hard skeletons and fixed abode, on the one hand, and their free swimming active relations to the medusoids, or jelly-fish, on the other.

In doing so we gradually weave a wider web. We are no longer content with the one class one representative, but pass on from order to sub-order, and sub-order to family and genera; and in all this process of expansion there is no limit at which we need stop, save such as cost and labour may temporarily set.

The growth of a Type collection goes on in different planes. We extend, on the one hand, to illustrate our scheme of classification from one grade to another, but at the same time, as it were, in another plane, we begin to show in each and all cases more numerous details of structure, not merely external forms, but the great morphological peculiarities and anatomical variations.

It is plain that in the making of such a collection we must seek to vary our conception of our task with the various groups on which we happen to be engaged. The study of different groups of the animal kingdom does not in all cases teach us in equal measure, or suggest the same train of thought.

The *ornithorhynchus*, the crocodile, or the New Zealand *sphenodon*, may, for instance, suggest morphological lessons in the main, and serve each as the centre or pivot for a series of osteological and anatomical preparations illustrating their own morphological features, their affinities with ancient types, and their relation to, or contrast with, their companions in the modern world.

A series of ordinary birds, on the other hand, may, in a Type collection, serve to illustrate the range of minor variation, unaffected by grave morphological differences ; and these, the innumerable varieties that such a series will display, may, in a greater or less degree, illustrate the more interesting adaptations to environment, function, and habit.

Yet another group may be used ; perhaps the land *mollusca*, for instance, though many others will do equally well to illustrate, as far as any one particular group can, the main lines of geographical distribution.

And again, in others (the insect suggest themselves here) we may be tempted to pass away from considerations of theoretic knowledge and to illustrate the practical applications of our science to the affairs of men.

Our Type collection, in short, has not one part to play, nor one monotonous lesson to teach, but deserves to be manipulated so that all the many sides and aspects of our science may receive illustration in turn.

MR. E. M. HOLMES (London) spoke in terms of high praise of the plan set before them. A new, and very commendable, feature in the Perth museum was the collection of specimens illustrating forest trees. The revival of interest in forestry made such a collection a very useful one. He would suggest the exhibition of a collection of insects injurious to trees—and, indeed, to all plant life.

PROFESSOR TRAIL (Aberdeen) said that he had followed the course of the Perth museum from its inception with great interest. Its founders had started with an intelligent plan, and had kept rigidly and consistently to it from the beginning. The result was that they had produced a model Local Museum, and it was to be hoped that many other cities would profit by the example thus set. He noticed with particular approval the separation of the Index Collection from the local collections. The former was intended to give the visitor a general view of natural history, and this could not be done entirely by specimens drawn from a limited area.

CANON NORMAN wished to remind botanists who were present that they would have an opportunity of seeing an excellent collection of Clova plants at Perth.

MR. BOLTON (Manchester) considered that the members of the Perthshire Natural History Society were doing a good work in making their museum illustrate the natural history of the county in which it was situated. The plan of illustrating a definite and limited area was a most commendable one, for it was capable of attainment and was very instructive to visitors, the bulk of whom would always be from the neighbourhood of the museum. He would suggest that the whole of the British Isles should be divided into convenient districts, and that local scientific societies should be urged, and, if necessary, assisted, to fully investigate and illustrate the natural history of their respective districts. He was glad to see the Perth museum leading this movement.

MR. BATHER (British Museum) said that the smallness of a museum was not an unmitigated drawback ; it gave the curator good reason for the rejection of unnecessary specimens, and thus was a safeguard against over-exhibition. In an index museum it was especially necessary to guard against needless multiplication of exhibited specimens. An index collection for £5 had been spoken of. This was quite practicable ; indeed, he believed that a fairly satisfactory collection could be provided for five shillings. The danger was that such a collection, which must necessarily consist of specimens belonging to widely different groups, would in time be indefinitely expanded by the interpellation of specimens illustrating intermediate groups, till at last it would become a collection illustrating biological classification, even to families. He deprecated the introduction of subsidiary collections—*e.g.*, a series illustrating the geographical distribution of snails—into a general or index collection. Such collections were very valuable, but they should be kept apart. There was no objection to

using specimens of the same species in different collections; thus *Helix pomatias* could be used in the Index museum to represent the Gasteropoda, and it could also appear in a series illustrating the geographical distribution of land mollusca.

MR. MADELEY (Warrington) advocated the use of two index collections, a small introductory one—the five-pound series spoken of—followed by a larger and fuller one for those who had mastered the introductory series. In the Insect galleries of the British Museum there is a small series, like the five-shilling set referred to, giving a slight outline of the Insecta; then follows a larger collection, corresponding to the five-pound set, giving a fuller synopsis of the class; and then follows the general collection of insects. Mr. Bolton was mistaken in supposing that the Perth museum was the first County museum. At Chester the museum authorities had for a long time made it their aim to illustrate the natural history and archæology of the county, and by including the latter science they had taken a wider range than the Perthshire Natural History Society.

MR. COATES said that he and his colleagues were anxious to obtain advice from the curators of other museums, and that they would welcome any suggestions. With regard to injurious insects, they intended shewing a series of these, and also of injurious fungi. They should not fall into the danger of indefinitely increasing an Index museum, for they had started a definite scheme clearly marked out, and only such specimens as were contained in that scheme would be exhibited. In conclusion, he invited all present to come and see the Perth Museum.

THE PRESIDENT said that all who could should go to Perth on Friday, for they would have an opportunity of seeing a thoroughly well-arranged county collection. The Perth museum had been formed by the generous and self-sacrificing efforts of a few men who had spent much labour and money upon it. It would be a great discredit to the City of Perth if the Town Council did not recognise the public spirit of the founders of the museum by maintaining what they had instituted. A sum of £30,000 had been left for the endowment of public institutions in Perth; the interest on this, if supplemented by a small rate, would quite suffice to give the city an efficient Library and Museum.

TYPE SPECIMENS IN BOTANICAL MUSEUMS.

By E. M. HOLMES, F.L.S., CURATOR OF THE MUSEUMS OF THE
PHARMACEUTICAL SOCIETY OF GREAT BRITAIN.

IT is with some degree of diffidence that I venture to place before you some suggestions for facilitating the work of students and of visitors to Botanical Museums, but which may, perhaps, be applicable in a modified form to other museums.

These suggestions have reference to type specimens. Those who have had occasion to refer to large herbaria for the purpose of identifying a plant or a series of plants, will, I think, acknowledge that a great deal of time is often wasted in the attempt to find a type specimen, even when it is known to exist in a particular herbarium.

In the first place, the type specimen may belong to a widely distributed species, and a number of sheets of specimens may have to be turned over before the presumed type is met with. If the specimens are arranged under different countries, the search will take a still longer time, and when the supposed type is found there may, perhaps, be only a note of exclamation after its name, the significance of which may be clear to the Curator of that particular herbarium, but to no one else ; or there may be no indication that the specimen is a type, beyond the fact that the writing is that of the author of the species, and if, as is often the case, the author has not signed his name, there is no means of ascertaining (except by wasting the time of

one or more of the officers of the museum) whether or no the writing is that of the author of the species. When one has to travel some distance in order to reach the museum, this waste of time presses somewhat heavily on the student.

Type specimens are of necessity unique, and are widely scattered in different countries, and in both public and private collections, so that a lengthened correspondence often takes place before the exact locality of a type specimen can be ascertained.

At the present time, when such vigorous attempts are being made to settle once for all the correct name to apply to a plant, it is of considerable importance to be able to refer to type specimens. Authentic specimens, *i.e.*, specimens distributed by the author of a species, as identical with his type, are not invariably correct, for sometimes the author confuses two nearly allied species, and in other cases in which, as in many cryptogams, the distinctive characters are of a microscopical nature, a mixture of species externally similar in appearance may occur.

The description of the type specimen given by its author, although sufficient at the time it was written to distinguish it from other species, becomes insufficient when other nearly allied species are subsequently discovered. In such cases nothing but a reference to the type specimen can settle the difficulties that arise.

When a botanist, describing new species, desires to know if a particular plant differs from a known species, which itself is differently understood by various botanists, he cannot proceed with his work until he has compared it with the type. But, museums possessing type specimens are rightly chary in sending them across the seas, even in mail packets. It is obvious, therefore, that any method which prevents risk of loss of type specimens, and at the same time helps the student, should prove useful.

The suggestions that I have to offer with this end in view are as follows :—

- (1) That all type specimens of plants should be stamped or labelled with the words "Type specimen," followed by the reference to the page of the work in which the author described it.
- (2) That type specimens should be kept in a special case, and each one marked with a catalogue number.
- (3) That a printed or typographed catalogue of such specimens should be kept for sale or exchange by each museum.
- (4) That photographs of type specimens, or of portions of them (if large) of the natural size, should be kept for sale or exchange by each museum.
- (5) That photographs of the handwriting of all known botanists, arranged alphabetically according to their names, should be made and supplied for sale or exchange.
- (6) That a list of the private herbaria, or collections of known botanists contained in each museum, with the date, when known, of their presentation or purchase, should be compiled for sale or exchange.

There does not exist any complete list of the location of the herbaria of botanists. The only two works of the kind with which I am acquainted are the "Musée Botanique de M. B. Delessert" and "La Photographie" of A. De Candolle, both published by Masson et Cie. of Paris. The proposed catalogue might be made uniform in size with these.

The importance of giving the date of receipt of such herbaria is much greater than appears at first sight, since it sometimes happens, as in the case of Mrs. Griffiths (the well-known algologist), that several museums claim to possess the special collection; in which case the date

throws some light upon the point, for botanists rarely part with their own special collections during their lifetime.

I have offered these suggestions only in the hope that others may improve upon them, or find some useful application of them to other branches of science.

PROFESSOR WEISS (Manchester) said that the question of dealing with types was a most difficult one, but it was one that would have to be considered. It had been suggested that all types should be lodged in a central institution in London. This plan he considered impracticable; it would leave many gaps in collections, and would annoy donors. Making a list of type specimens was practicable and useful, and he would examine the collections in his charge carefully and catalogue the types. But it must be remembered that it is often difficult to say what is the type specimen of a species. He was in one case applied to for the type of a species of Liverwort. He got out the sheet on which the type was said to be mounted, and found that there were *two* specimens on it!

PROFESSOR TRAIL (Aberdeen) thought that great advantages would result from the gathering of types in definite centres, but he also admitted that great practical difficulties lay in the way of carrying out the suggestion. But whatever might ultimately be done in this direction, it would be well for curators to lose no time in making lists of the type specimens in their herbaria, and he, for his part, would at the earliest opportunity make a list of the types in the collections under his care.

CANON NORMAN considered that part of the work of the Association should be the publication of lists of the type specimens in provincial museums. Many local museums contained buried treasures scarcely known to the outside world. In such cases, curators would do well to prepare lists for publication in the Annual Report of the Association.

MR. W. E. HOYLE (Manchester) said that a list of the types in the Owens College collections had already been published by the Association. He regretted to say that the publication of this list had called forth hostile criticism.

MR. H. M. PLATNAUER (York) said that though the list mentioned by Mr. Hoyle had been attacked, nothing had been said which could

be considered as disproving the utility either of the list in question or of any others of the same kind. He hoped, for his part, that other curators, undeterred by criticism, would follow the excellent example set by Mr. Hoyle and Mr. Bolton.

MR. BATHER (British Museum) said that he fully approved of the issuing of lists such as the one referred to. All that he complained of was the publishing of the description of a new species under a wrong date. The Report of the Association should in every case bear the date of the year in which it actually appeared. With regard to the question already touched on, what constitutes a type? he should say that it is a question which even specialists would sometimes find it hard to answer. He wished to call attention to the work of Mr. Davies Sherborn, who was engaged in preparing a list of historical collections. He thought that curators would do well to help Mr. Sherborn by supplying him with lists of the collections in their museums. A full list of these collections should be published in alphabetical order. It was more important for a specialist to know where a certain collection was to be found than to know the contents of any particular museum.

THE PRESIDENT said they had all been taught to "take care of the pence." He looked upon inconspicuous specimens, such as those alluded to by Mr. Holmes, as the pence of Natural History. They deserved the special care of specialists.

COLOUR TINTING AND ITS APPLICATION TO MICROSCOPIC WORK.

CONTRIBUTED BY GEORGE BELL TODD, M.B.,
Professor of Zoology, Anderson's College, Medical School, Glasgow;
Ex-President Andersonian Naturalists' Society.

BY way of introduction, I may state that I do not at the present moment know whether the use of various colours obtained by transmitted light has ever been thoroughly worked out; certainly they have been employed by investigators in this country, but more particularly in the Continent.

Professor Cleland, of Glasgow University, mentions to me that M. Brücke advised the use of a canary-coloured glass slide for the microscope on which unstained specimens were examined under transmitted light in order to differentiate various histological structures. Spectral colours, either by prisms or by prismatic tubes filled with coloured fluids, have been employed. The same is true of vessels filled with coloured fluids placed between the source of light and the specimen. As to the influence of light itself on lowly micro-organisms, the experiments of Nägeli on the swarm spores of *algæ*, *infusoria*, etc., prove the stimulating influence of light on these beings, whereby they tend to collect on the part of the cultivation dish most exposed to the light.* This is also markedly shown in the case of *Euglena viridis*.

* The Cell. O. Hertwig, English translation by Dr. Campbell, 1895, p. 100.

Stahl¹ and Strasburger² both show how sensitively and quickly the zoospores of algæ react to light.* Indeed, Strasburger has named those zoospores, which hasten toward the source of light, light-seeking (Photophytic), and those which travel from it, light-avoiding (Photophobic).

Stahl has proved that the intensity of light affects the movements of the chlorophyll in plants; for example, how, in the *Alga Mesocarpus*, in a fairly weak light the chlorophyll bands turn at right angles to the path of the rays (surface position); if, however, the light is intense, they place themselves in the direction of the rays (profile position).

From the experiments of Cohn and Strasburger it is proved that not all the spectral rays exert an influence on the direction of the movements of the zoospores, but only those which are strongly refracted, as blue, indigo, and violet, while yellow and red rays intercept movement.

The arrangement I designed and attached to my microscope occurred to me while investigating the influence of colour on the Protozoa some months ago, and more recently on the "gastrula" stage of Echinoderm ova, and as it may be useful to others for scientific purposes, I will shortly describe and explain its arrangement and the uses for which I have employed it.

The difficulty I had in my experiments was to find a suitable medium as a screen on which to throw the transmitted light before it reached the specimen. First, I tried the effect of a bi-concave mirror with red-stained

*¹ Ueber den Einfluss von Richtung u. Stärke der Beleuchtung auf einige Bewegungsgeserscheinungen im Pflanzenreich.—*Stahl.* Botan. Zeitung, 1884.

² Wirkung des Lichts und der Wärme auf die Schwärmsporen.—*Strasburger*, Jena, 1878.

glass on one side, and blue-stained glass on the other, but found that unless the light impinging on the mirror was strong in the case of the red, the illumination of the field was weak. I next tried the use of thin pieces of stained glass—blue, red, orange, green, etc.—placed between the mirror and the stage, but found they also intercepted the rays of light too much. I even tried stained cover-glasses as thin as I could get them, fixing them on the under surface of the glass slide with collodion, but found them expensive and easily broken. At last, I found that thin films of coloured gelatine gave the best results. It is very thin, and intercepts scarcely any light, at least inappreciable for the lower powers of the microscope. It is very inexpensive, and can be obtained in a great variety of colours suitable for investigation purposes: it is used commercially in large quantities by cosaque and bon-bon manufacturers.

I then had a diaphragm made consisting of two parts, the upper fitting into a flange on the lower. The diaphragm contains several apertures, one of which is left blank, the others filled with the thin gelatine films, coloured carmine, blue, red, orange, and green. The diaphragm is fixed in this instance in a slotted compartment on the stage just above the ordinary diaphragm, but in such a manner that the one works quite independently of the other, and, being almost concealed from view is out of harm's way, where it is ready for use when wanted.

The arrangement is adaptable to any ordinary microscope. From experience I find that it is unnecessary to have a diaphragm at all, for by simply laying the coloured gelatine film over the reflecting mirror a temporary tinting or colouring can be given to the whole field by the coloured rays reflected from the mirror.

Where an iris diaphragm is used it is only necessary to

slip in a coloured gelatine film above the iris mechanism, and this may even be used, together with the Abbé condenser without any alteration of the microscope whatever ; lastly, the film may be placed on the stage, and the slide with the specimen above it, and fixed by clips. (The micro-photographs shown at this meeting were obtained by this last method.)

These are methods in which the microscope carries the coloured films. Another method is to place the colour *between* the source of light and the reflecting mirror of the microscope, as has been already noticed, by vessels filled with coloured fluids, only using instead coloured gelatine screens, or, I would suggest, by the use of the lime-light lantern, when either coloured glass or gelatine plates could be used, as, for instance, in giving a demonstration to a class, the microscopes could all be illuminated from the same source of light and the colours introduced at pleasure, so that each member of the class could view the effects of the same coloured rays of light at the same time on similar specimens.

The experiments I have made on *algæ*, with reference to the influence of colour on protoplasmic movement, are for the most part confirmatory of what is already known, viz., that red or orange rays slow such movements, while blue or violet rays quicken or stimulate movement.

In *Anacharis* or *Elodea Canadensis*, my colleague, Professor Thomas King (Anderson's College) and myself made a very interesting experiment on July, 7th inst. We examined the streaming movements of the chlorophyll granules (chromatophores) by ordinary transmitted light under $\frac{1}{8}$ -in. power (Reichert), and found them travelling along the outer layer of the cell protoplasm at a moderate speed. Watching a particular granule, it took on an average twenty seconds to complete its journey, or three times round the cell in one minute.

Having watched these movements for an interval of ten minutes, we tried first an *orange* then a *red* screen, which had the effect of slowing the streaming movements of the chlorophyll granules, many leaving the outer layer of the moving protoplasm to take up a stationary attitude in the more central parts of the cell, and turning flat with their sides towards the light as if endeavouring to expose their largest surfaces in order to seek more light, while the few granules that remained in the outer layer continued to stream around, remaining on their edges at a gradually decreasing speed during an interval of a quarter of an hour.

We next tried a *blue* screen. The first influence of the blue rays seemed to stimulate the movements of the granules, as they became gradually quicker until they reached the ratio of thrice round the cell in one minute, but gradually slowed down again at the end of fifteen minutes. At this point we had to give over the experiment owing to the unfavourable conditions of light and atmosphere, as it threatened a thunderstorm. I made a note at the time—barometer, 29.8; temperature, Fahr. 65° in shade; light, very dull grey. We felt that it was just possible the slowing of the movements might after all be due to the weather conditions and the want of light. However, on Tuesday, the 13th inst., I obtained a fresh supply of *Anacharis* from Mr. Dewar, curator at the Botanic Gardens, and under favourable conditions of light and good weather was able to confirm what I had already noticed.

In *Volvox minor* I noticed that the hæmatoccus-like bodies to which it had given birth showed a curious *ruby* colour of the chlorophyll under a green screen with transmitted light. The explanation was this, that the chlorophyll, which is here brown, by transmitted light had a green background from the screen, and a considerable

amount of daylight getting in from the upper side of the slide and cover-glass gave a curious polarising effect, producing the red colour, which was got quit of by excluding daylight from above the slide. In all cases under examination by transmitted light it is necessary to exclude as much daylight from above the stage as possible, unless when the screen is large enough (like the one shown) to throw a body of coloured light both above and below the stage at the same time.

In micro-photography the use of colour screens seems to be of service in bringing out details of structure not attained by the ordinary methods. Take, for example, an unstained section of rhizome of the fern, *Pteris aquilina*, or Bracken.

I asked my friend, Dr. Thomas Reid of Glasgow, one of the most accomplished of biologists and expert of micro-photographers, to conduct the following experiments:—

- (1) To take a micro-photograph of the specimen under the microscope in the ordinary way.
- (2) To choose an orange-coloured screen and take another micro-photograph.
- (3) To repeat the above with a red-coloured screen.

I may state that in the two last cases the most simple means were used—a gelatine film was placed on the stage immediately below the glass slide, the apparatus focussed, and the micro-photograph taken in the usual manner.

The following table shows the result:—

Without Screen.	With Screen.	Time.	Exposure.	Develop- ment.	Light.
No. 1	—	20 secs.	Full	Over	Incan. G. light.
	No. 2, Orange	40 secs.	Rather under	—	„
	No. 3, Red	40 secs.	Rather under	—	„

The following results are detected in the negatives :—

In No. 1, owing to slight over-development, the half tones are wanting and seemingly deficient, but in reality have never been brought out. In No. 2, *Orange Screen*, with 40 secs. exposure, the woody and lignified parts come out best. In No. 3, *Red Screen*, with 40 secs. exposure, all the details are brought out evenly all over the field ; both the brown, woody, and light-coloured parts come out well.

These results would seem to show that for some specimens, where the contrast is great between the characters of their tissues, it is an advantage to use a coloured screen in order to assist in bringing out details, and to assist in a micro-photographic representation of structures otherwise only slightly affected by transmitted light, and conversely that the character of the light can be altered by the colour of the screen.

Isochromatic plates were used in this instance.

Amongst the Protozoa, Rotifera, etc., which are mostly colourless, I have used coloured gelatine screens to give temporary tints to the animals while under observation. For some, such as *Amœbæ*, an orange or carmine colour will serve to intensify the outer layer and show off the more granular inner layer, while the borders of the contractile vacuole just before contraction takes place are well defined. In *Paramæcium* a blue tint brings out the cuticle, and very markedly shows the endoplasm, contractile vacuoles, etc.

In Rotifera an orange or blue tint makes a good background for throwing out details.

The best results I got by tinting were in the ova of Echinoderms, using both carmine and blue colours.

The segmentation process is beautifully shown under a carmine colour.

The "gastrula" stage comes out well under colours like *red* or carmine, but particularly *blue*; the outer and inner layers are perfectly distinct, and the cilia are more easily seen in action as the little embryo rolls over and gaily swims about.

In demonstrating the ciliary movement in the gill of the mussel, it is an advantage to have a carmine- or blue-coloured background.

In the case of examination of a very young embryo chick, the section of which was unstained, the use of a blue-coloured screen served to bring out the details of the developing eye in a wonderful degree. The section belonged to Dr. Gemmil, the assistant to the Professor of Anatomy at the Glasgow University.

As to the colours used in staining the gelatine films they are for the most part aniline colours; the reds and blues are luckily pure, but many of the other tints are mixtures of various colours. I have examined some of the shades with the spectroscope, and find in several cases bands, sometimes two, three or more appearing in different parts of the spectrum. If it is the study of coloured light alone that is wanted, then it is necessary to use optically pure colour like the three colours I now show you. They are called orthochromatic screens, and are employed in the new colour photography.

For mere tinting, suitable aniline colours are good enough.

Fortunately, the lenses of most good microscopes are apochromatic, or at least tested for red and blue rays by their respective makers.

When using a gelatine film always remember to keep it dry, for if it becomes moist or wet it is ended.

I propose to render the gelatine films insoluble by treatment with Alum Sulph.: first staining, then fixing

and hardening the film. In using a chromate, as has been proposed there would be considerable difficulty in chromatising gelatine coloured with coal-tar colours, because the colour is in many cases discharged or altered by exposure to light in the presence of a chromate salt.

It would be preferable to chromatise plain gelatine, expose to light, well wash, and then soak in a solution of the desired colour.

In a similar way a 5 per cent. solution of commercial, 40 per cent. formic aldehyde or formalin has been proposed. Gelatine treated with formalin will resist boiling water, but whether the formic aldehyde would attack the various colours is a question I cannot answer.

PROFESSOR WEISS (Manchester) considered that this method of examination would be very useful in dealing with colourless objects, but for objects like sections of *Pteris* stem, exhibited by Dr. Bell Todd, staining was better than coloured light, for the colour was then confined to definite tissues. For many living objects, such as Rotifers, it should answer very well; probably, too, for *Algæ*. But he considered that to satisfactorily test the action of light on living organisms, experiments should be conducted in a dark room so as to exclude white light.

MR. W. WHITE (Sheffield) asked whether the experiment had been tried of projecting the object under examination on a screen by means of the lantern microscope.

MR. E. M. HOLMES (Pharmaceutical Society) said that coloured screens might well be used in museums for the protection of objects which were bleached by ordinary daylight.

DR. BELL TODD in reply said he had adopted precautions to prevent daylight from mixing with the coloured light used in his experiments, and believed that his precautions had been effectual.

DESCRIPTIVE LABELS FOR THE GEOLOGICAL DEPARTMENT, PEEL PARK MUSEUM, SALFORD.

By HERBERT BOLTON, F.R.S.E., Assistant Keeper, Manchester Museum,
Owens College.

IN arranging the Geological collection of the Peel Park Museum, Salford, I had to face a difficulty in that the resources of the Museum did not permit of a geological assistant, and that the geologically-inclined visitor would need to depend entirely upon his own resources and the contents of the cases.

It seemed to me absolutely necessary to attempt to supply the place of a geologist by means of descriptive labels. With the approval of the Museum Sub-Committee I commenced the series of labels which I now exhibit. In planning these labels I first sought to put myself in the place of a visitor who wished to know

- I.—Why a System was so called.
- II.—Why and how it received a name.
- III.—What the collection was intended to teach regarding that System.
- IV.—What relations the several Systems bore to one another.

To answer these questions I made the following Heads of Matter, and strove, so far as limits of space and local considerations allowed, to deal with each one:—

HEADS OF MATTER.

- I.—The name of each System, and why given.
- II.—Lithology or Rock character of each System.

- III.—Conditions under which the rocks of each System were formed.
- IV.—The main features of the development of life during the period covered by each System.
- V.—Present geographical distribution, within the limits of England and Wales more especially.
- VI.—The main divisions of rocks in typical areas.

The labels were made of an uniform size of 6 inches by 9.

The district served by the Museum being a Carboniferous district, I wrote out a somewhat fuller account of this System and made two labels of it. (*Note.*—For the use of other museums these are now replaced by one.)

Now, just a word as to what I tried to avoid. I tried to avoid technicalities, lists of fossils, and taking any side upon questions which are still under discussion. How far I have accomplished my end it is for the members of this Association to judge.

We have heard before this Association again and again of the difficulties which await the label writer, and we have been plainly told that whilst descriptive labels are desirable and essential in all well-ordered museums, yet that it were folly to attempt the task, it so trandscends human ability. This may be so, and none feel the force of arguments like these more than I, but there is a wise diffidence and an unwise one, and I felt I could not in justice to students leave the collections at Salford with no statement of what geology attempts to do and to teach.

I know the many faults of these labels, and perhaps for every point to which exception may be taken I can add three more, but, nevertheless, I place them before you as an earnest and honest attempt to assist the youngest and least-learned student of geology, and as furnishing some basis upon which better and more useful labels may be constructed.

PRE-CAMBRIAN OR ARCHAEN GROUP.

Under the above term are grouped large areas of crystalline and semi-crystalline rocks associated with thick beds of red sandstone, shales, and conglomerates. The group includes the oldest of all known rocks. The sedimentary rocks of the series have been subjected to most complex mechanical strains and stresses which have effected a great change of character. It is only in rare cases that the sedimentary origin can be recognised, and then only with great difficulty. The mechanical deformation has in most cases completely altered the mineral character of the rocks. Eruptive material has repeatedly penetrated the beds and become incorporated with them, whilst the immense lateral pressure which has been exerted has caused the beds to crumble up and over-ride one another in the most wonderful way.

Rocks of the PRE-CAMBRIAN ERA are well developed in north-west Scotland and the Hebrides, and have been divided by Sir Archibald Geikie as follows :—

TORRIDONIAN,	Red Sandstones, Conglomerates, and Shales.
LEWISIAN,	Gneiss, and associated rocks of the Outer Hebrides, west of Sutherland and Ross.

A series of crystalline schists and eruptive rocks occurs in the north and west of Ireland which are regarded as of PRE-CAMBRIAN AGE. Authorities are not wholly agreed upon the Pre-cambrian rocks of England and Wales, but rocks of this age probably occur in the Malvern Hills, the Wrekin, the Isle of Anglesea, and Pembrokeshire. In Pembrokeshire, Dr. Hicks divides the series into—

PEBIDIAN.
ARVONIAN.
DIMETIAN.

It must be borne in mind that the Pre-cambrian includes all rocks older than the Cambrian, whether they be sedimentary in origin or not, and that most of these are not yet fully understood.

CAMBRIAN SYSTEM.

So called by Sedgwick, who first worked out the stratigraphical structure in North Wales (Cambria). The rocks which make up this system lie at times upon the Pre-cambrian or Archaean, but in such a manner as to indicate that a great lapse of time intervened between them. They consist of sandstones, consolidated pebble-beds or conglomerates, shales and slates, whose surfaces are often marked by sun-cracks, ripple-marks and rain-pittings. They were evidently formed in shallow water, and are usually much disturbed, folded, and metamorphosed. Volcanoes were active in the Welsh region, great lava sheets and beds of volcanic tuff being found interbedded with the sedimentary rocks.

Animal life was abundant during the period, and in some cases highly developed. The dominant forms of life were Crustacea, of which *Trilobites* were the most important. A small shrimp-like crustacean known as *Hymenocaris* is especially common in the Lingula Flags. True Mollusca were few in number, but Brachiopods, which had very similar shells, were represented by forms known as *Lingulella*, *Orthis*, and *Obolella*. Marine worms have left abundant traces of their burrows, tracks, and castings.

The varied life forms of the Cambrian are so highly developed and numerous that it is believed they must have been preceded by earlier forms having greater simplicity of structure. Recent researches give considerable support to this belief.

CAMBRIAN rocks occur most abundantly in Wales, Shropshire, the east of Ireland, and the north-west of Scotland. In North Wales the Cambrian has been divided as follows :—

UPPER or <i>Olenus</i> ZONE,	{ Tremadoc Slates. Lingula Flags.
MIDDLE or <i>Paradoxides</i> ZONE,	Menevian Group.
LOWER or <i>Olenellus</i> ZONE,	Harlech and Llanberis Group.

ORDOVICIAN SYSTEM

(*Lower Silurian*).

The term "ORDOVICIAN" was given by Professor Lapworth to the rocks classed as "Lower Silurian" by Murchison. The latter term is still adopted by many authors.

The Ordovician consists of dark slates, shales, flag-stones, sandstones, and a few bands of limestone. Great sheets of volcanic material are interbedded with the sedimentary rocks, and were evidently poured out over the sea-floor at various times whilst the beds were being deposited. This evidence of great volcanic activity during the period is a strong feature.

The life of the period was abundant, especially over muddy bottoms. Crustacea were still pre-eminent, the *Trilobites* being numerous and of many species. The chief life forms, both in number and species, were *Graptolites*, lowly Hydrozoa, which built up a horny tube-like axis supporting little cells on one or both sides, each of which lodged a polyp. These organisms existed in great numbers, but the life of a species was usually short, so that succeeding deposits had their own species of Graptolite. By means of the Graptolites, the Cambrian, Ordovician, and Silurian Systems have been divided into zones.

Brachiopods were abundant in the seas, but accompanied by a fair number of true mollusca, of which the Gasteropods and Cephalopods were perhaps most noteworthy. Plant life probably existed, but is only known by the remains of doubtful fucoids or sea-weeds. The Ordovician series is well developed in Wales, Shropshire, and the English Lake District.

The Ordovician of Wales and Shropshire has been divided as follows :—

CARADOC AND BALA GROUP.

LLANDEILO GROUP.

ARENIG GROUP.

The Ordovician of the Lake District Series is divided into—

CONISTON LIMESTONE SERIES, { Ashgill Shales.
Coniston Limestone.
Dufton Shales.

BORROWDALE SERIES.

SKIDDAW SLATES.

SILURIAN SYSTEM.

The Silurian System was so named by Murchison, the *Silures* being an ancient tribe of Britons once inhabiting a tract of country on the borders of Wales in which these rocks are well developed. The Silurian (Upper Silurian of Murchison) is composed of two widely-differing sets of rocks, one series found in Shropshire, and the other occurring in North Wales, the English Lake District, and the south of Scotland. The former series consists of soft mud-stones and fossiliferous limestones; the latter of grits, slates, and shales, which have a general resemblance to the members of the Ordovician.

The SILURIAN PERIOD was marked by prolific life. In this period we find the first undoubted traces of land life, both animal and vegetable. The Period is remarkable for the great development in form and number of Corals, Crinoids, Brachiopods, and Crustaceans, whilst the highest sub-kindgom of animal life—that of the VERTEBRATA or back-boned animals—is represented by the remains of the fishes which occur in a bone bed near the top of the System. Many of the phyllopod crustacea are of giant size, and their remains have been most excellently preserved. *Trilobites* are well represented, but now reach their full development. Gasteropods and Llamellibranchs occur in increasing number and variety. The Cephalopods are remarkable for their size and development. Some forms were straight (*Orthoceras*), others were curved (*Phragmoceras*), others globular or pear-shaped (*Ascoceras*), or coiled, as in *Lituites* and *Nautilus*, the *Nautilus* being the only group of Silurian Cephalopods existing to day.

Plant life is represented by the spore cases of lycopodiaceous plants, by branching stems and other evidences of a cryptogamic vegetation, and by sea-weeds.

The generally recognised divisions of the Silurian are—

LUDLOW SERIES.

WENLOCK SERIES.

UPPER LLANDOVERY SERIES.

DEVONIAN AND OLD RED SANDSTONE SYSTEM.

The Devonian System was so named by Sedgwick and Murchison, who worked out its details in the County of Devon. The Devonian rocks consist of slates, grits, and limestones. A series of red sandstones, shales, and conglomerates are found in Wales, the north of England, the north-east of Scotland, and in Ireland, which are now known to be equal in point of age with the Devonian series. They have received the name of Old Red Sandstone partly on account of their character, and partly to distinguish them from younger rocks of similar appearance.

The **DEVONIAN** rocks have the greatest distribution and represent the marine conditions which prevailed during the period, whilst the **OLD RED SANDSTONE**, which occur in isolated patches, supposed to be the sites of ancient lakes, represent land and lacustrine conditions. That these rocks were formed in inland lakes is now regarded as proved, and the boundaries of some of these lakes have been described. The rocks contain an assemblage of life forms which could only have existed in fresh water, or on the land. The finer flaggy sandstones have yielded great numbers of peculiar fishes remarkable for the great development of an external armour of bony plates and scales, and of defensive spines. None of these fishes had true bony skeletons, their hard parts being entirely external. Large lobster-like crustacea also existed, one form (*Pterygotus*) being no less than four feet in length. The land vegetation was abundant, and foreshadowed the peculiar and luxuriant flora of the succeeding Carboniferous period. Ferns and plants closely allied to the club-mosses were common. Insect life also existed, one form of May-fly having a spread of wing of five inches, whilst traces of land-snails and myriapods have been found. The marine (Devonian) life of the period is represented by remains of sea-weeds and an abundance of corals; Lamellibranchs were abundant. A few remains of fishes have been found similar to those of the

Old Red Sandstone. The Devonian rocks may be readily divided into Lower, Middle, and Upper Series. The Old Red Sandstone cannot be so readily divided, a middle member being questionable.

CARBONIFEROUS SYSTEM.

The greatest deposits of Coal occur in rocks in this age, hence the name **CARBONIFEROUS**.

The **CARBONIFEROUS SYSTEM** can be easily divided into two series which were formed at different periods and under widely different conditions.

MILLSTONE GRIT AND COAL MEASURE SERIES.

CARBONIFEROUS LIMESTONE AND YOREDALE SERIES.

The *Carboniferous Limestone Series* consists mainly of thick limestones and shales. The Carboniferous Limestone has been traced over nearly the whole of Ireland, a great part of England and Wales, and far into Eastern Europe. It had an east and west extension of nearly 800 miles.

It rapidly diminishes northwards, and in Scotland becomes partially replaced by sandstones, shales and coals, forming what is known as the *Calcareous Sandstone Series*. The fauna of the Carboniferous Limestone is very rich in Crinoids, Corals and Brachiopods.

Chambered Cephalopods were fairly common. Trilobites were much reduced in size and of few species. On the other hand, shrimp-like crustaceans increased in number and variety. Fishes were undoubtedly abundant, but have left few traces of their presence, the remains found fossil being usually stout defensive spines and teeth.

The Millstone Grit and Coal Measure Series consists of sandstones or grits, shales and coals.

The Millstone Grits are chiefly massive sandstones with interbedded shales, and a few thin coals.

The Coal Measures are divided into Lower, Middle, and Upper, the chief deposits of coal occurring in the Middle Measures. The Coal Measures consist of sandstones very similar to those of the Millstone Grit, with dark shales, iron-

stones, fire-clays and coals. They must once have had an enormous geographical development, but are now found in detached areas or coalfields.

The fauna is a peculiar alternation of marine, estuarine, and fresh-water forms of life. But few land forms are known. The shales in the immediate neighbourhood of coal seams are usually full of ferns and plant remains, allied to the club-mosses of to-day, whilst fragmentary remains of *Coniferæ* occur rarely in "coal-balls"; other shales are rich in marine shells. Fish remains are abundant in the shales, and occur at times in the coals. Whole fishes are not unfrequent, but more usually they are represented by detached scales, teeth and spines, many of the latter being of large size. Land animals include spiders, scorpions, beetles, gasteropods, may-flies, and other insects, many of the latter of huge size. *Amphibia* appeared about this time and were of a salamandroid character.

PERMIAN SYSTEM.

PERMIAN rocks received their name from the province of Perm in Russia, where they are extensively developed.

The PERMIAN or DvAS SYSTEM consists chiefly of red sandstones, conglomerates and marls. In most cases the series rest unconformably upon the Carboniferous and older rocks, but at times they are strictly conformable and the passage from one series to the other is very gradual. The conditions under which they were deposited would seem to have been very unfavourable to life, for fossils are few in number and variety.

So far as the sparse life-forms of the Permian rocks are known, they show a close relation to those of the Carboniferous, of which they may be regarded as an impoverished persistent type. Cycadaceous plants made their appearance and formed the dominant type of vegetable life. The most remarkable life-forms of the Permian were, however, the *Amphibia*. Most of the forms were extremely small. In nearly all of them the internal skeleton was not completely bony, but an external skeleton, or armour of plates and bony shields was present; these latter structures have been most perfectly preserved.

Permian rocks occur in north England, and present two well-marked types. In the north-west the series is as follows:—

UPPER RED SANDSTONE, MARL AND GYPSUM, - 600 ft.

MAGNESIAN LIMESTONE AND MARL SLATE, - - 10-30 ft.

LOWER RED SANDSTONE MARLS AND CONGLOMERATES, 3000 ft.

It will be noticed that the middle number is comparatively unimportant. In the north-east, the upper and lower beds are reduced to about 100 feet in thickness, whilst the Magnesian Limestone swells out to 600 feet and is very fossiliferous.

TRIASSIC SYSTEM.

The TRIAS received its name in Germany, where it was found capable of a triple division. In England, however, only Upper and Lower Trias can be distinguished with certainty, the middle member, known as Muschelkalk, being absent or nearly so. The rocks of the TRIASSIC SYSTEM have a close similarity to those of the Permian which they overlie. In several cases it is almost impossible to distinguish between them. The Triassic rocks consist of red sandstones, conglomerates and marls, with thick beds of gypsum and rock-salt, the latter especially forming a distinctive feature. Many of the sandstones are sun-cracked, ripple-marked and rain-pitted, and many bedding planes, once the original surface of the deposit, are covered with the tracks and trails of animals. As in the case of the Permian rocks, to which the Trias is so much allied, fossils are few in the sandstones and marls, but in the middle limestones of Europe an abundant fauna has been preserved.

Corals and Crinoids were tolerably abundant, the latter often forming large masses of rock as in the Carboniferous. The Brachiopods are remarkable in that most of the Palæozoic types now disappear and Lamellibranchs become the most important and abundant, remaining so onwards to the present. Most of the Cephalopod forms of the Palæozoic died out in the Trias, their place being taken by other groups known as Ammonites, which flourished abundantly throughout the whole of the Mesozoic times.

The chief interest of the Triassic period is centred in the wonderful reptilian forms which abounded and of which many

remains have been found of late years. Many of the reptiles were three-toed and walked mainly on their hind legs. Their foot-prints were long supposed to be those of birds. The earliest crocodiles are of this age. The teeth and lower jaws of lowly mammals allied to the marsupials (Kangaroo, etc.) have also been found, and are the first trace of this, the highest division of animal life.

The Triassic rocks occur from the south coast of Devon to the coast of Durham on the east. They are well developed in the Midlands, and occupy the greater part of Cheshire and the coast of Lancashire.

Divisions of the Trias—

UPPER TRIAS OR KEUPER.

MUSCHELKALK (absent in England).

LOWER TRIAS OR BUNTER.

LIASSIC SYSTEM.

This System is often united with the succeeding one, the OOLITIC, under the title of JURASSIC. The LIAS has three well-marked divisions, and consists of clays, calcareous and alum shales, and thin-banded limestones.

In Yorkshire the beds of the Middle Lias contain a thick Ironstone Series, which is extensively worked in the Cleveland district.

The LIASSIC PERIOD was chiefly remarkable for the great development of Ammonites and large forms of marine reptilia. Of these, the *Ichthyosaurus* and *Plesiosaurus* are most noteworthy.

Whilst the life-forms already mentioned are most characteristic of the Lias, the invertebrate fauna was abundant, and, although the rocks are marine in origin, remains of insects and land plants are by no means rare. Crinoids, Starfish, and Mollusca were very abundant. The reptilian remains show that many of these creatures were of large size and adapted for existence in the sea. Some forms exceeded 30 feet in length.

The Ammonites are exceedingly common throughout the whole series. Certain species succeed each other with great regularity. The horizons at which they occur being thus rendered

distinctive, are called "Zones" and serve to still further divide the series.

The Liassic rocks extend from the south coast of Dorset to the east coast of Yorkshire, and are divided as follows:—

UPPER LIAS	{	Zone of Ammonites (<i>Stephanoceras communis</i>).
		" " (<i>Harpoceras serpentinus</i>).
MIDDLE LIAS	{	" " (<i>Amaltheus spinatus</i>).
		" " " <i>margaritatus</i> .
		" " (<i>Egoceras Henleyi</i>).
		" " (<i>Amaltheus Ibex</i>).
		" " (<i>Egoceras Jamesoni</i>).
		" " (<i>Arietites raricostatus</i>).
		" " (<i>Amaltheus oxyntonus</i>).
		" " (<i>Arietites obtusus</i>).
		" " " <i>Turneri</i> .
		" " " <i>Bucklandi</i> .
LOWER LIAS	{	" " (<i>Egoceras angulatus</i>).
		" " " <i>planorbis</i> .

OOLITIC SYSTEM.

This System is so called because its limestones are often built up of minute rounded grains which resemble the roe of a fish.

The OOLITIC SYSTEM consists largely of shelly and earthy limestones with clays and sands. In the North of England and in Scotland the Oolites contain sandstones and thin coal-seams in which fossil ferns and Cycads are fairly plentiful. Parts of the Coral Rag or Corallian have been regarded as fossil coral reefs, the corals being found just as they grew up on the ocean floor in continuous banks.

The general life forms of the Oolite are very similar to those of the Lias, the reptilian fauna having undergone a greater development. The huge sea reptiles of the Lias lived on into the Oolite, and were accompanied by still larger land forms, and by others capable of flight. Amongst the land reptiles we may instance *Megalosaurus*, whose remains are found in the Stonesfield Slate. It is estimated to have had a length of 25 feet. *Cetiosaurus*, another of these creatures, was about 50 feet long and 11 feet high. A thigh bone found at Oxford is 5½ feet long.

Some of the limestones of this period have yielded the remains of reptiles adapted for flight by reason of the bones of one finger of the hand being enormously lengthened to support a fold of skin which stretched out from the body, so that the creature could fly like a bat. The Solenhofen Slates of Bavaria have yielded the remains of the first true bird, known as the *Archaeopteryx*. This bird, whilst possessing wings and feathers like birds of to-day, was in many respects a reptile; for example, it had a long jointed tail and the jaws were furnished with a series of teeth.

The Oolites extend in an irregular band across England, from Dorsetshire on the south to the east coast of Yorkshire.

In England and on the continent of Europe it has the following divisions:—

	ENGLAND.	EUROPE.
UPPER OOLITE,	{ Purbeck Beds, - - - Portland Oolite, - - - Kimeridge Clay, - - -	Purbeckian. Portlandian. Kimeridgian.
MIDDLE OOLITE,	{ Coral Rag, - - - Oxford Clay, - - -	Corallian. Oxfordian.
LOWER OOLITE,	{ Cornbrash, - - - Great Oolite Group, - - - Fullers' Earth, - - - Inferior Oolite, - - -	Bathonian. Bajocian.

CRETACEOUS SYSTEM.

So called from its chief deposit being chalk (*creta*). The System is largely developed in Britain, the greater part of the south-eastern counties being covered by it. In the north-east of Ireland (Co. Antrim) and the west of Scotland (Mull) members of the Cretaceous System are overlaid by vast sheets of columnar basalt poured out in Tertiary times. The deposits of the Lower Cretaceous (Neocomian) indicate that they were accumulated in fresh, brackish, and salt water. The Upper Cretaceous deposits are wholly marine.

LOWER CRETACEOUS (NEOCOMIAN).—This division consists of a lower series of beds of sands and clays. The character, sequence, and extent of these deposits are similar to those of modern deltas.

They are supposed, therefore, to represent an old delta formation whose area must have been close upon 20,000 square miles. They occupy a district known as the Weald of Kent and Suffolk, and are hence called the WEALDEN.

Upon the Wealden beds lie an upper series consisting of variously coloured sands, clays, and limestones. They are termed the LOWER GREENSAND owing to the presence of a green mineral called Glauconite, and possibly represent marginal sea deposits.

UPPER CRETACEOUS.—The Upper Cretaceous overlaps the edges of the Lower in such a way as to suggest unconformity. It is divided into—

I.—*The Gault*, a stiff blue clay, largely fossiliferous, and varying from 100 to 200 feet in thickness.

II.—*The Upper Greensand*, consisting of brown and grey sands charged with glauconite, irregular beds of marl, and sandstones.

The Glauconitic and Chalk marls are chalky deposits which underlie the true chalk formation.

III.—*The Chalk without Flints* consists of gritty chalk below, passing into massive chalk and chalk rock above.

IV.—*The Chalk with Flints* is a soft, pure chalk containing bands of nodular flints. The uppermost division of the Cretaceous System (Danian) is well developed on the Continent, but no certain English equivalents have yet been found.

The Fauna of the Cretaceous period was an extensive one. The great mass of the deposits consists chiefly of an infinite number of minute shells termed Foraminifera. The chief forms are *Globigerina*, *Orbitolina*, and *Rotalia*. Sponges and Mollusca were abundant, but corals were few and insignificant. Sea-urchins and Cephalopods literally swarmed in the seas, and their remains are found in abundance in the chalk. The chalk is especially rich in fossil fishes, the conditions being favourable for their preservation. Reptilian life was abundant, but less varied than in the Jurassic.

The Flora of this era is marked by the appearance of the highest orders of vegetable life. Plants allied to the Oak, Myrtle, Willow, Eucalyptus, etc., occur together with Cycads, Conifers, Ferns, and Equisetaceæ.

EOCENE SYSTEM.

This System was so named by Lyell, who considered that it marked the beginning of recent things, and recognised a low percentage of the fossils as identical with forms now living. The Eocene rocks of the British Isles are wholly confined to South-eastern England, where they occupy two basin-shaped depressions in the chalk, known as the London and Hampshire Basins; these were originally united, but have become separated by denudation. The rocks of the System consist mainly of sands, clays, and beds of rolled flint pebbles. A thick limestone called the Nummulitic Limestone was formed during this period, and has been traced over Europe, Asia, and Africa. It had an enormous geographical development and a thickness of several thousand feet.

The animal and plant remains of the Eocene are abundant.

The flora was most important, and shows by its character that the climate was of a somewhat tropical nature. Palms, bread-fruit trees, and similar exotic plants grew along the rivers, together with laurels, yews, chestnuts, beeches, elms, poplars, willows, etc.

The animal life was also indicative of tropical waters; crocodiles, turtles, tortoises, and sharks being especially abundant in the neighbourhood of what is now London.

Land animals were represented by tapir-like creatures, wolves, foxes, and others allied to hedgehogs, squirrels, and bats. Ancestral forms of many of the higher animals, notably the horse, appeared during this period, certain animals having an assemblage of characters only found to-day in widely separated forms.

The Eocene of South-eastern England is subdivided as follows:—

	HAMPSHIRE.	LONDON.
UPPER.	Headon Hill or Barton Sands. Barton Clay.	Upper Bagshot Sands.
MIDDLE.	Bracklesham Beds and Leaf Beds of Bournemouth and Alum Bay.	Middle Bagshot Beds, part of Lower Bagshot Sands.
LOWER.	London Clay (Bognor Beds). Woolwich and Reading Beds.	Part of Lower Bagshot Sands. London Clay. Oldhaven Beds. Woolwich and Reading Beds. Thanet Beds.

OLIGOCENE SYSTEM.

The term "OLIGOCENE" was proposed by Professor Beyrich for a series of deposits which had been formerly classed as "Older Miocene or Upper Eocene."

The sedimentary rocks of the OLIGOCENE AGE in the British Isles are of very limited extent, being confined to the Hampshire Basin and the Isle of Wight.

They consist of thinly bedded sands, clays, marls and limestones, which were accumulated partly in the sea, partly in brackish, and partly in fresh water. The rapid alternation of one series of beds with another would seem to indicate that the surface was often altered—at one time forming a sea bottom, at another a land surface. The plant life consisted mainly of evergreens somewhat allied to the tropical floras of India and Australia. It comprised forms such as ferns, fan and feather palms, conifers, cinnamon trees, custard-apples, and gum trees.

The Molluscan fauna was very abundant, and included many forms belonging to genera now living. One series of beds has yielded a great number of insects.

The marine vertebrate remains include rays, sea-snakes, crocodiles, turtles, and a whale (*Balenoptera*). Mammalian remains occur in the uppermost beds.

The remarkable leaf-beds of Bovey Tracy in Devonshire are regarded by certain geologists as of the Oligocene Age, whilst by others they are supposed to belong to the Middle Eocene.

During the Oligocene period volcanic action was violent in the north of Ireland, along the west coast of Scotland, and as far north as the Faroe Isles, Iceland, and Greenland.

To this period belong the great sheets of basalt which form the Giants Causeway in Ireland, the Isle of Staffa, and many of the most striking features of the Western Isles of Scotland.

In England the Oligocene System has been divided into—

HEMPSTEAD BEDS.

BEMBRIDGE BEDS.

OSBORNE BEDS.

HEADON BEDS,

MIOCENE SYSTEM.

No true Miocene deposits have yet been recognised in this country. It is generally believed that Northern Europe and England were elevated into a land surface during this period, whilst South-eastern Europe was much depressed, the sea reaching even to the foot of the Alps.

The chief area of deposition was in the neighbourhood of Vienna, the Miocene rocks there constituting what is called the "Vienna Basin."

The European deposits show that the climate was sub-tropical in the early part of the period, but colder towards its close.

The Marine period is noteworthy for the great development of the larger mammals, and for the occurrence of wild animals (carnivora) similar to those now existing.

PLIOCENE SYSTEM.

The chief European deposits of this System are developed in South Europe. The English rocks are of a purely local character, and of no great thickness. They consist mainly of friable calcareous sands heavily impregnated with iron, and known as "Crags," which are separated from all the older rocks, including the Miocene, by a strong unconformability. It is probable that a great interval of time elapsed between the close of the Miocene and the commencement of the Pliocene in this country.

Pliocene deposits are best represented in south and south-east England, although isolated patches have been found as far to the west as St. Erth in Cornwall.

The period seems to have commenced with a climate very similar to that of the Miocene; but became gradually colder, until at last it approached an almost Arctic character.

The sub-tropical vegetation was driven southwards, its place being taken by many of our English forest trees, wild flowers, ferns, and water plants. Amongst these we may instance the buttercup, marsh-marigold, chickweed, dock, pondweed, cotton-grass, and royal fern. The animal life of the Pliocene in Europe included such forms as rhinoceroses, hippopotamuses, elephants,

deer, the existing horse, and a small form known as *Hipparrison*, which had three toes on each foot instead of one. Flesh-eating animals were represented by bears, the sabre-toothed tiger, hyænas, etc.

The shells well indicate the climatic change which took place, the southern forms gradually giving place to others of a more northern type, many forms towards the close of the Pliocene being of a true Arctic character.

The Pliocene is divided as follows :—

NEWER PLIOCENE <i>(Cold temperate),</i>	{ Forest Bed Group. Weyburn Crag. Chillesford Crag. Norwich Crag. Red Crag. Walton Crag.
OLDER PLIOCENE <i>(Warm temperate),</i>	{ St. Erth Beds. Coralline Crag. Lenham Beds. Basement Beds.

PLEISTOCENE SYSTEM.

This System may be regarded as the beginning of the most recent phase of the earth's history.

In its older deposits the molluscan remains belong almost wholly to living forms, whilst the latter deposits are also marked by the inclusion of remains of many of the highest Mammalia or milk-giving animals.

The early Pleistocene is known as the ICE AGE or GLACIAL PERIOD. It was a period of great cold in the northern hemisphere, the greater part of the British Isles being covered with snowfields and glaciers. By means of the moving ice, boulders of rock were carried to great distances, ice-scratched and more or less rounded. The surface rocks in the path of the ice were polished and scratched by the stones in the bottom and sides of the glaciers. The softer rocks were reduced to marls, clays and sands.

Many questions relating to this period are yet unanswered. It

is not certain whether the ice which carried the stones and formed the thick boulder clays was wholly land ice or in part icebergs. One theory supposes that the land was submerged, and the clays and stones deposited by icebergs. Another theory explains the formation of these deposits by land ice alone.

Apart from theories, it is certain that thousands of tons of rock matter from Scotland and the English Lake District were carried southwards by ice and scattered over other counties lying to the south. The mountains of Wales, Ireland, and Scandinavia were also centres of ice dispersion.

It is supposed by many that the Ice Age is capable of a triple division—two periods of glaciation being separated by a warm interval, in which some parts of the land sank a few hundred feet beneath the sea, and sands and gravel were deposited. The Ice Age has left its record in the form of thick clays containing Scottish, Lake District, and other rocks, all marked with ice scratches, and in beds of sand and gravel containing fragments of marine shells; many of the surface rocks are also smoothed and polished. Some districts present low hills of moraine material and all those evidences of ice action which can be seen in regions where glaciers exist at the present time.

PALÆOLITHIC AGE.

(Ancient Stone Age.)

Under this term is included the period in which man first appeared in Northern Europe. It is doubtful if he existed in the earlier stages of the Ice Age, but very probable that he made his appearance before its close. For this reason, the Palæolithic Age is often regarded as a sub-division of the Pleistocene.

The first traces of Man are found in ancient river gravels, caves, and in deposits known as "Brickearths."

The gravels of many old river terraces contain rudely chipped flint knives, spear heads, and arrow heads. The floors of many caves in limestone districts have been found to contain similar implements, together with bone needles, harpoons, and boring tools of various kinds.

The River-drift man would appear to be older than the Caveman, and, judging by his tools, he lived by hunting, and fashioned

into implements the stones lying nearest to his hand. The Cave-man used rock shelters of various kinds, and disputed their tenancy with various wild beasts ; he lived by hunting and fishing, cooking his food by means of hot stones. From the occurrence of bone needles we infer that he was clad, most probably in the skins of the animals he had killed.

The Cave-man possessed considerable artistic ability, and incised upon pieces of bone and antlers figures of the various animals he hunted and was familiar with. He has left spirited etchings of the hunting of the reindeer, and of the mammoth, horse, pike, and many other forms. The bones and teeth found in association with the tools of Palæolithic man show that he was contemporary in this country with the horse, mammoth, reindeer, rhinoceros, cave-bear, hyæna, tiger, ox, and sheep.

The bones of Palæolithic man have been rarely met with. He is supposed by some to be the ancestor of the Eskimo.

PREHISTORIC PERIOD.

The Prehistoric Period is by some authors made to include the Palæolithic Age and the succeeding interval of time which elapsed up to the commencement of written history. This latter interval is divided into Neolithic and Bronze Ages.

NEOLITHIC AGE (*Polished Stone Age*).—This age has left evidence of man and contemporaneous animals in many ordinary surface accumulations, peat-mosses, lakes, and shell-mounds. The climate was probably colder than at present, but still capable of permitting the existence of many of the larger animals. The chief animals then living were the horse, deer, reindeer, great wild ox, hare, rabbit, wolf, fox, wild boar, brown and grizzly bears.

Neolithic man was widely different to those who preceded him. He built log and wattle huts in stockaded camps, dug circular pits for refuge, mined the flints best suited to his purpose, and polished many of his stone implements. In some cases piles were driven in the bottom of lakes and huts erected upon them, communication with the shore being either by narrow gangways or dug-out boats.

Civilisation was so advanced that the weaving of linen, agriculture, and pottery-making were carried on, and such animals as the horse, shorthorn, pig, goat and dog domesticated.

A rude commerce existed whereby useful stones were bartered to great distances. Tribal wars took place, and various eminences were fortified and used as rallying points during times of war.

Burial took place in caves and barrows or cairns. In the latter the body was placed in a central chamber made of large stones, over which earth was heaped until a low dome-like structure was formed. A long passage communicated from the edge of the barrow to the central chamber. The burial of implements with the bodies would seem to indicate that some belief existed in a future state.

PREHISTORIC PERIOD.

(Bronze Age.)

The third stage of man's history was marked by an important advance in the knowledge and use of metals. Tin and copper were mined, and then melted together to form bronze. This substance was found so extremely useful that it gradually displaced stone, most of the chief implements being made of it.

The Bronze Age has been divided into Early and Later. In the former the chief tools were bronze daggers and wedge-shaped axes. In the latter swords, spears, and socketed celts were manufactured and often received elaborate ornamentation. The bronze axe commenced as a flat wedge inserted in the head of a suitable handle. It gave place to the flanged wedge or palstave, and lastly to the socketed celt in which the end of the handle was bent at an acute angle upon itself, and inserted in the hollowed-out bronze celt.

Civilisation was well advanced. It is probable the people were familiar with the art of weaving, and wore linen and woollen clothing. Their hair was long, and kept in place by hair-pins and the use of head-rests during sleep. They wore ornaments such as earrings, necklaces, pendants, amulets, and gold and silver beads.

It is probable that oxen were used for ploughing, and horses for riding and driving, whilst the crops were cut by reaping hooks.

The pottery was hand-made and ornamented. The chief weapons of warfare were the bronze axe, dagger, short double-edged sword, and flint arrows.

The dead were cremated and the bones placed in an urn, over which was built a mound of earth forming a barrow or cairn. A religion was known and practised, and many, if not all the "druidical temples" of this country were built by these people. The best examples are those of Stonehenge and Avebury.

The men of the Bronze Age were probably existing at the time of the Roman invasion, 55 B.C., when the written history of this country may be said to commence.

PROFESSOR CARR (Nottingham) spoke in terms of strong approval of the labels prepared for the Salford Museum by Mr. Bolton. He urged, however, that they did not sufficiently deal with the geographical range of the formations described. He suggested that they should be supplemented by small maps like those in Barnes' "Rock History," in which a particular rock, or the rocks of a particular formation, were marked in a distinctive colour. Another plan was to procure small blank maps and colour them in as required by hand. He added that he had been indebted to Mr. Bolton's last paper (on the arrangement of a Geological Museum, Proc. 1895, p. 150) for several valuable suggestions, some of which he had carried out in practice with excellent results. He instanced specially the use of Geological photographs as wall-pictures.

MR. MIDGELY (Bolton) said that he, too, had found Mr. Bolton's paper most useful. He had been led to the adoption of a definite three-inch unit for tablets in the Bolton Museum, and he also used differently tinted papers for the labels referring to different formations. With regard to the present paper, he considered labels such as those brought before the meeting by Mr. Bolton useful to the student as well as to the general visitor. The only fault he had to find with Mr. Bolton was for not printing thirty or forty sets instead of three or four.

MR. MADELEY (Warrington) spoke in high terms of Mr. Bolton's labels, and said that he should be very glad to secure a set for the Warrington Museum if a set could be got.

MR. BATHER (British Museum) said that when he had a label printed he generally had several extra copies pulled off for distribution. He suggested the formation of a Label Committee, whose function should be to acquire and distribute descriptive labels, or, when necessary, to edit such labels.

MR. HOYLE (Manchester) pointed out that co-operative labelling had been tried, but that it did not prove a success. A Committee had been formed to work on lines identical with those suggested by Mr. Bather. But at Manchester they at last got tired of waiting for the results of the Committee's labours, and they had accordingly printed such labels as they wanted in the Museum. They had in this way labelled the Mammalia and most of the Mollusca, and extra copies of their labels could still be had.

MR. PLATNAUER (York) in referring to the Label Committee said that the great difficulty encountered by that body had been the production of a label that was generally suitable, or, at least, generally acceptable. Museum curators generally prefer labels of their own devising to any submitted to them.

MR. BOLTON in reply spoke of the great difficulty of making a satisfactory descriptive label. Often a label that had seemed satisfactory appeared quite inadequate when read in print. The amount of time and care necessary for the production of descriptive labels could only be appreciated by those who had tried to compile them. He hoped that these labels would be printed in full in the Report, and that separate copies would also be struck off. With regard to maps, he doubted whether they would be really useful, as the smallness of their scale would preclude accuracy in the colouring.

THE PRESIDENT considered the plan of printing the labels in the Report, as suggested by Mr. Bolton, an excellent one, and he expressed a hope that the editors would carry it out.

HOW MAY MUSEUMS BEST RETARD THE ADVANCE OF SCIENCE?

VARIOUS subjects have at various times suggested themselves to me as appropriate for a paper to be submitted to this Association, but when I read the magnificently exhaustive address by Dr. Brown Goode, published in our last Report, it was manifest that all the ideas I had ever had were anticipated in that masterly production. There is, however, one side of our subject which has hardly had the attention paid to it that it undoubtedly deserves. We have been taught how best to arrange our museums for the satisfaction of the collector, of the student, of the investigator, or of the British public, but no one has ever pointed out to us the magnificent opportunities that are at our disposal whereby we may accomplish the great work of retarding the advance of science. It will perhaps not be wholly waste of time if we devote a few minutes this morning to considering this great power that is in our hands and how we may avail ourselves of it.

There are certain lines of conduct that are so surely and obviously prejudicial to science that the most uninstructed curator scarcely needs to be reminded of them. None of us but has been taught how to bewilder the eyes of the public with thirty specimens of an object, all placed the same way up, and displaying as few of its essential characters as possible, when one specimen properly labelled would have

sufficed. We know how to strike dulness through the hearts of thousands by our funereal rows of stuffed birds with their melancholy lines of Latin names ; we know how to chill the enthusiasm of young, and to disgust the susceptibilities of tender, souls by the display of entrails and abortions stewing in some brown decoction in the depth of antiquated pickle-jars. To suggest such well-known methods to the experienced audience of practical curators before me would be ridiculous and a waste of time. Fortunately there are further means that may be employed, and more subtle actions that may be performed, all tending to the same end.

First let us consider that jealousy with which a museum curator should guard the precious specimens entrusted to his care, forbidding the profane hands of the mere anatomist ever to disturb them in their holy rest. An excellent instance is afforded us by the history of the genus *Spirula*, of which an account has recently been published by Dr. Pelseneer in the Report of the "Challenger" Expedition (Appendix, Zoology, pt. 83). Naturalists for long desired to obtain individuals of this interesting genus for dissection, but only fragmentary specimens came into their hands. At last, in 1865, a complete individual was collected near Port Jackson. The hopes of the naturalist were raised ; "but," says Pelseneer, "but it was deposited in the Sydney Museum, and consequently could not be made the subject of anatomical research." There are other specimens in various public and private collections, notably in London ; but they too, like the specimen in the Sydney Museum, cannot be made the subjects of scientific investigation. As curators we must regret that two specimens which were in the hands of a captain of the French Navy, who for many years zealously refused to trust them to a zoologist—we must, I

say, regret that, in the words of Pelseneer, "on the death of their owner, thanks to Professor Giard, these *Spirulæ* did not become the prey of a public collection." There are investigators so eaten up with their own conceit as to be bold enough to say that a specimen which shows nothing cannot be hurt by dissection, since it cannot show less and there is the chance of its showing more. Be not deceived! Do not allow the hidden recesses of your specimens to be explored by the devastating scalpel! What does it matter whether their internal anatomy can be seen or no? They have been entrusted to you for safe preservation, and you, as a faithful steward, will have to render account of the same.

The exhibition series of a museum are, in their essence, potent agents for retarding the advance of science. By mere force of circumstances, lack of time, undermanning, and so forth, the arrangement of specimens in the showcases of a museum remains the same throughout many years, and names there applied to genera and species cannot be constantly changed. Classifications come and classifications go, but the classification that was adopted when the museum was built, say fifty years ago, seems likely to go on for ever. Possibly even those who are in favour of introducing ideas into our scientific classifications, and who think that the arrangement of species and genera should be in accordance with their affinities and the facts of their structure, and therefore should change as our knowledge of that structure increases; even those fanatics, I say, may possibly regard this influence of museums as in some sort a chastering one. After all, it may not conduce to the advancement of science that each of us should have his own special classification and should call animals by his own pet names; and the museum here comes in, like its com-

panion the text-book, as a maintainer of stability amid the vagaries of ephemeral publication. Still, knowledge *does* increase, science *does* advance, and classifications and names unfortunately do change. It is in our power to prevent this knowledge percolating to the mass of the people. If we are unable, like the text-book writers, to foist upon the public senile illustrations that are nothing better than caricatures, still we can always excuse an effete arrangement or an obsolete nomenclature on the plea that we cannot possibly find the time or the money to re-arrange or re-name the specimens. We can with much show of justice refuse to give concrete form to the philosophic ideas of our greatest thinkers. We can refuse to allow our specimens to be experimented with, and arranged this way or that way according as a systematist may desire to check the working-out of his system.

Allied to the natural conservatism of museums is another efficacious practice. It is a well-known story that in the good old days of zoology, when species were regarded as separate creations, a profane sceptic ventured to ask one of our greatest zoologists what he really did manage to do with the connecting links. After looking carefully round the room, the zoologist whispered in reply, "My dear sir, I throw them out of the window." It is these window-specimens that form the basis of our theories of evolution. It is by their means alone that we can work out the numerous problems that are pressing on us to-day—the problems of geographical distribution, the problems of heredity and growth, all the vast problem of the origin of our groups of animals. It is these window-specimens that the museum curator always has suppressed with a stern hand: may he long continue to do so! How absurd it would be to expect otherwise! Under what names

should we enter them in our registers? How could we place them in our cases? Where indeed should we find the room for the thousands of variations from the central types that are to be met with in all parts of the world? A museum, being finite, must select more or less, and if we select only those specimens that agree with the diagnoses of authors, we shall be saving both ourselves and the authors a vast amount of trouble. With regard to the numerous details valued by that exacting creature the modern biologist—details of locality, of season, or, in the case of fossils, of the definite zonal horizon—it is hardly necessary to add that their accumulation would involve the curator in enormous labour, and if indulged in would probably lead him to the collection of an absurd number of specimens.

All that I have yet said may be summed up in the one phrase "Shun ideas!" Would it be believed that a certain Professor Herréra, of the National Museum of Mexico, has recently produced a paper in which he says that the museum of the future is to be a museum of ideas? "There will be no gallery of birds, or of mammals, or of fishes, or of reptiles; no collection of Coleoptera, no collection of Chiroptera, or of pheasants, or of pigeons. Museums of the future do not classify by classes, families, tribes, genera, species, sub-species, varieties, sub-varieties, races and sub-races; they put in order facts, and classify ideas. There are rooms for heredity, for ontogenesis, coenogenesis, variation, mimicry, the struggle for life, nutrition, and so on. These rooms are arranged in a philosophical order, and in that order they must be visited by the public; to this end there will be barriers suitably disposed. In the museum of the future the specimen is the lacquey of an idea; whereas, in our present museums, ideas are the slaves of specimens.

Thus a specimen is not exhibited because it is rare, or because it ought to be exhibited; we show the most profound contempt for specimens that are rare, curious, or pretty. The museum of the future aims at being, not a magazine of dead lumber eaten by worms, but an open book in which, men can read the philosophy of nature." And, after suggesting some ideas that may be exemplified in museums, our author concludes, "But, instead of studying these ideas and exhibiting them in his museum, from time immemorial man has tried to imprison the things of nature in a fixed system, a fixed classification, which is not the whole of science, and which cannot be the nest of the whole of philosophy. Nature, in her vastness, protests against the classifiers; maddened, indignant, despairing, she revolts against routine." What rubbish! How can the curator at £70 a year be expected to have ideas of this kind? And how, assuming that he has found the intelligence, how can he spare the time to put them into operation? And what would our Boards of Governors, our Trustees, our Town Councils say if they went into a museum and found a curator, instead of mounting specimens by the hundred, and making as large a display as possible, calmly sitting at his table reading the "Origin of Species," or the latest number of the *Archiv für Entwickelungs-Mechanik*?

A propos of the curator, he has been described, and very rightly, as the soul of the museum. What kind of a soul does the museum want? It is obvious that the curator should not be a scientific man; for if he be, he will constantly be led astray from his work of labelling, ticketing, mounting, and so forth, to investigate the relationships, distribution, and what not, of some new species that has come into his hands; or, in tracing out some peculiar facts of anatomical or historical interest, he will waste the time

that should be employed in compiling a list either of specimens figured by others or of his own grievances. The function of a curator is to keep his specimens clean, to keep them in order, and to exhibit them in such manner as will satisfy the annual visitation of his Board of Trustees, or his Town Council. The motto that the curator should hold before his eyes is that famous one, "Surtout point de zèle." It is not for him to add to the stores of the museum by spending his Sundays in the country collecting fresh specimens, or his holidays in foreign lands to verify the localities whence specimens have come. It is not long since a paper was read before this very Association, read, I regret to say, by a person for whom I am in some respects responsible, recommending that the museum assistant should be sent out "to collect in the fields, the rocks, and the seas," then that he should "study the specimens that he has collected, each of which will have for him an interest and a living history which under present conditions it never has; by their means he will extend the boundaries of knowledge and confirm the foundations of system, so that it is for him an expression of universal thought, and no longer a mechanical device for sorting species into their places. Then, with this vitalised classification, and with some real meaning in his head, he will proceed to prepare his most instructive specimens for exhibition, so that the final result may convey to others something at least of the beauty he himself has found in the world." So too, at the beginning of the century, P. A. Latreille wrote in Somini's edition of Buffon ("Insectes," I., p. x.) "L'homme, qui n'étudie les Insectes que dans son cabinet, peut être de-scripteur; mais il ne sera jamais, à ce que je pense, un profond entomologiste." But the curator does not require to be "un profond entomologiste," "un profond géologue," "un profond biologiste," or anything that remotely

resembles a scientific man. The curator should take for his pattern and exemplar the clerk in a dry-goods store.

We turn now to a certain practical detail in the arrangement of our museums, which fortunately seems to commend itself to the outside public who are not scientific people, and especially to the donors of specimens and bequeathers of collections. I mean this idea of keeping certain collections separate according as they happen to have belonged to some person with a lengthy name, or to have been described by some pottering genius of the locality, or, perhaps, merely to have been presented by some individual, who, because his name was utterly unknown, desired to adopt this method of bringing it into prominence, and laid it down in his will that his specimens were to be known for all eternity as the "Peter Smith Collection." This method, at all events, places an insuperable bar in the way of our associating specimens that the student wishes to compare, and enables us to hide from the gaze of the travelling man of science specimens of historic interest that he may have come to our museum on purpose to see. Permit me here to indulge in a fragment of autobiography. Many years ago I journeyed to Strassburg on purpose to examine certain specimens that had been described by Mr. de Loriol. The various curators whom I met at the Museum assisted me very willingly throughout three days searching for these specimens, but they could not be found, and I went on my way sorrowing. Arrived at Freiburg, I mentioned the fact to my friend, Professor Steinmann, who suggested that possibly the specimens might have been overlooked as being in the Cartier collection. At considerable expense and inconvenience I therefore returned to Strassburg, and, sure enough, there were the specimens carefully obscured. I have known instances of eminent foreigners coming to a

great museum in our own country desirous of inspecting certain remarkable specimens, and, after searching for many hours in the cases where all logic would lead one to imagine the specimens were, learning at last that they were at the other end of the museum because they had once belonged to some vain-glorious amateur, or been described by some muddle-headed genius of the dark ages. Who, after this, can say that such a system is not to be encouraged?

Somewhat akin to the distribution of specimens among various collections, and equally efficacious as a skid on the wheels of science, is the practice that still obtains in the majority of our museums of separating recent and fossil forms. It is necessary that I should say some words about this, because there are in this and other countries certain people who strongly urge the amalgamation of these collections, coming out with such absurd *dicta* as that one specimen should not be separated from another because it happens to be preserved in stone instead of in spirits, maintaining that the evolution of life and the relations of the present to the past are far more easily seen if one has not to walk several hundred yards to see the living ally of a fossil species. They also believe that the zoologists are led into errors through their ignorance of extinct animals, an ignorance largely fostered by the museum custom of keeping them apart; and they deny that the palaeontologist can properly understand the fossils with which he deals so long as he is prevented by the assumed necessities of museum arrangement from studying living forms *pari passu*. An intimate friend of my own, who happens to be officially connected with one of our greatest scientific establishments, has privately complained to me that his studies found yet another difficulty in the fact that the books

which are supposed to deal with modern life are placed in two or three separate rooms at a considerable distance both from one another, and from the room that contains the books dealing with extinct life. Nor is this all. He adds that, when the necessities of the case compel him, as they often do, to visit one of the other libraries, he is actually scowled at as an intruder by his fellow-workers in that department. It is clear that in the institution to which my friend has the honour to belong the true museum-spirit is still flourishing with vigour. It is this spirit, this idea of separation, of privacy, and as it were, personal property, to which the Greeks appropriately applied the term *ἰδίωσις*—it is this that we curators must continue to foster, if we are seriously desirous of retarding science.

To carry on the *ἰδία ἴδιωτικα*: a Museum should keep itself to itself; it has nothing to do with the Free Library, with the University, or with the Zoological Gardens. Do you wish to be overpowered by a lot of rowdy students coming and pawing over your specimens; or do you, as a peace-loving curator, wish to be dragged off to give an opinion upon some new accession of an animal that is possibly dangerous? Remember, too, that by this co-operation your collections are likely to be increased to an unmanageable extent and your hours of labour will be lengthened without a corresponding rise in salary.

This leads me to consider an exceedingly difficult question—the lending-out of specimens. It is, as you are aware, the rule of the British Museum never to let a single specimen that has once been registered pass outside its walls, except as a donation or an exchange. Other museums are either, as you may prefer to term it, less careful or less miserly. There can be no doubt that science is greatly advanced when a reliable investigator,

working in one locality, is able to borrow from the museums of other cities or of other countries specimens that will aid his labours. On the other hand, there is this to be said in favour of the proceeding: that in a large number of cases the specimens that are thus loaned never return to the museum, and ultimately are lost to science. It therefore does not very much matter, so long as, if you lend them, you conveniently forget whether they have been sent, and so long as, if you keep them, you place the necessary obstacles in the way of the investigator.

But it may be retorted to the last argument: there is another way whereby these difficulties are avoided, and science greatly advanced. *Videlicet*, one museum can exchange type-specimens or special collections with another. Such a solution of the problem was laid before us at Dublin by Dr. H. O. Forbes. Now, on this question of the dispersal of types, a conversation that I had with a leading English entomologist impressed me forcibly. New species of insects, he said, are being described at the rate of about *6000 per annum*. Those who attempt to co-ordinate the scattered descriptions cannot possibly do so without comparing the type-specimens. Experience shows it to be impossible for even an expert to draw up a description that shall be accepted as recognisable by another expert. Further, no entomologist of ordinary human powers can retain in his memory the conception of any one species, much less of three or four hundred, sufficiently well for him to compare specimens in one museum with those in another, unless he can set them side by side. For any real advance in this subject, the type-specimens of all the species of a family must be gathered together in one room, so that the specialist may examine and compare them directly. This could be

done, either by the various type-specimens being lent for some time to another museum, or by a permanent interchange of specimens—one museum specialising in Hymenoptera, another in Diptera, and so on. The difficulties are felt most strongly in entomology, but they affect ornithology, botany, conchology, and other branches of systematic biology to a marked extent. Obviously, then, we have it in our power to retard the advance of these sciences or even to check it altogether, by jealously guarding our treasures, either forbidding them to leave their abodes under any circumstances whatever, or cleaving to our type-specimens as to some musty but sacred heirloom, useful only to aliens, but a tattered badge of pride to ourselves. Here is a weapon, the use of which has far-reaching results that appeal to the imagination with the certain annihilation they inflict. Fellow-curators, grasp your weapon, and, more powerful than Canute, force back the advancing tide!

DR. DYER said that many valuable truths had been humorously enforced by the paper they had just heard read. Much that Mr. Bather had said might rightly be applied to schools and universities. He was glad to find in the paper such insistence on the educational function of museums.

CANON NORMAN humorously satirized the spirit that prompted the British Museum authorities to refuse specimens for dissection, and that made so many people adverse to giving specimens to foreign investigators for examination. The refusal to lend out specimens caused confusion in Natural Science, for it often compelled specialists to found descriptions on an insufficient number of specimens.

MR. PLATNAUER (York) considered that the paper dwelt too much on the function of museums as helps to the investigation of the specialist, which, after all, was but part of their office. There was also an implicit approval of specializing on the part of the curator, which he considered a dangerous accomplishment in a provincial

curator. It meant that he either paid exclusive attention to part of the collections entrusted to him to the prejudice of the rest, or else that he arranged the collections in such a way as to give exaggerated importance to the branch in which he was interested.

MR. MADELEY (Warrington) asked if the only object of a museum was to further original research in Science? If so, further discussion was needless. But if, as he himself supposed, a museum might have other objects in view, there was something to be said on the other side. The paper was unquestionably interesting, and it advocated many useful truths. But it was too obviously the work of a scientific specialist whose experience of museum work was of a peculiar nature. Had Mr. Bather been a provincial curator, he would have modified much that he had written.

PROFESSOR CARR (Nottingham) said that the paper contained much truth, and that its humorous form enforced attention, but that it went too far. Some of the principles advocated, if pushed to the extent indicated in the paper, would reduce many museums to a state of chaos. The practice of lending type specimens, for instance, could easily be carried too far: it would lead to there being many gaps in collections. Besides this, there was the risk of the type being retained and also the risk of loss or damage in transit. He reminded those present of the irreparable loss that occurred when the vessel that was taking Agassiz' types to Dublin was wrecked.

MR. HOYLE (Manchester) said that all the types that had been lent during his tenure of office had been returned uninjured. He considered it a very good thing to lend specimens to specialists, especially to Mr. Bather, for such specimens came back with their value much enhanced by useful notes. With regard to the practice of keeping together particular collections, it had at least this advantage, that it saved the specialist a good deal of time.

MR. BATHER said in reply that it had been his endeavour throughout to divest himself of all that was special or peculiar in his museum experience, and to put himself into the position of a provincial curator. He ought to say for himself that he was not the absolute specialist that some of his critics seemed to imagine. He had not confined his attention to Crinoids, but had taken up also the somewhat remote group of the Brachiopoda. A curator was none the worse for being a specialist: he was not exempt from the old rule that a man should know something about everything and everything about something. Museums would not suffer from having specialist curators, for

successive curators would, in all probability, specialize in different directions. Museums, too, should specialize; each museum should be pre-eminent in some one department. But he had advocated the working out of general ideas by curators, and had recommended the reading of such books as the "Origin of Species." What was wanted was *ideas*, something to make people think. And that could not be done by rows of specimens. Mr. Bather then showed some labels devised by Dr. Jackson for distinguishing type specimens, figured specimens, and specimens with published references from each other and from the rest of the collections.

CANON NORMAN advocated the use of distinctively coloured labels for distinguishing type specimens and figured specimens.

ELECTROTYPEs IN NATURAL HISTORY MUSEUMS.

IN the Report of the last meeting of this Association are various suggestions as to the use of plaster casts in museums. Dr. Brown Goode shows how museums can enrich their stores and elucidate animal form ; Mr. Herbert Bolton recommends that every geological museum should obtain plaster casts of important fossils ; Mr. F. W. Rudler insists on the utility of plaster casts in collections of prehistoric antiquities. The point that, by means of such replicas of good specimens, museums can more cheaply and more adequately fulfil their functions than by purchase of inferior material is therefore a point that need not now be laboured.

But why plaster casts ? They are fragile ; when they get dirty it is difficult to clean them ; if soaked with wax or coloured in oil, they are apt to communicate greasy yellow stains to their mounts. Moreover, it is not easy to obtain by their means a really sharp impression of fine detail.

From all these points of view electrotype^s are superior. It is not everything that can be reproduced by their means, and for large specimens such as mammoths, plaster casts possibly are superior, though even for these plaster is inferior to *papier maché* so far as durability is concerned. But for small specimens of a hard nature, such as fossils, and especially for those of which only one side needs to be

reproduced, I have no hesitation in saying that electrotypes are far better than any other class of reproductions. I had for long been familiar with the electrotypes of fossil amphibians sent out by Dr. Anton Fritsch from the Museum at Prague, and my thoughts were more forcibly turned in this direction by the constant use made of this process in the reproduction of illustrations for printing. If it were possible so excellently, rapidly, and cheaply, to produce electrotypes of the most delicate engravings and the finest grained half-tone blocks, then it appeared to me that the same process might well be employed to retain copies of the various specimens that were constantly passing through my hands for the purpose of enriching the Museum with which I myself have the honour to be connected, or the other museums and other investigators that might desire to obtain copies of some of the famous specimens of the British Museum. I therefore entered into communication with the firm of Messrs. B. Dellagana & Co., 106 Shoe Lane, Fleet Street, London, E.C., who not only do a large business in making electrotypes of engravings but are employed by the Bank of England to produce electrotypes of coins. The manager, Mr. G. E. Holloway, and his practical electrotypers, Mr. A. Browning and Mr. H. Green, have applied themselves very heartily to the furtherance of my ideas, and have spared no pains to adapt the processes employed by them to this rather different and more difficult task. For their readiness and liberality I am most grateful. For the past year we have experimented with such specimens of fossils as I could obtain for the purpose, those belonging to the British Museum being out of the question, and a few of our results are now on the table before you.

The chief difficulty in making electrotypes, as in making casts of plaster or of any other substance, is the prepar-

ation of the mould. The process usually employed by Messrs. Dellagana is that of pressing a certain waxy composition by means of the hydraulic press over the surface of the object to be electrotyped. This process, which answers well enough for coins and engraved blocks must be applied to the more delicate fossils with considerable care. When the fossil is of fairly solid substance, such as a slab of Wenlock Limestone, and when at the same time it has a more or less horizontal surface without much undercutting, then it is possible to take a reverse impression by this process. Care must, however, be taken that the back of the fossil form a plane surface; for if it be curved, or there be projecting inequalities, the specimen will probably be cracked. This difficulty, however, may be overcome by temporarily embedding the specimen in plaster so as to produce a firm bed, or, I may suggest, by laying it upon a sandbag, such as I now invariably use when cleaning out small fossils with a hammer and graver. ~~In cases where there is much undercutting, or where the specimen is too delicate for any pressure to be applied, the moulding substance must be poured on in the liquid state, a method which also has its peculiar difficulties, the chief being the same difficulty as occurs in the case of plaster casts, that of working the fluid into all crevices and details of the specimen without introducing air-bubbles. Since neither of these processes are wholly satisfactory, Messrs. Dellagana have been experimenting for some time to obtain a moulding substance which they can apply with only slight pressure, and which shall be sufficiently elastic to come out of a moderate undercut. It is also necessary that the substance should not penetrate into the possibly porous material. Suggestions as to the best substances and compositions to be employed would be very welcome.~~

The electrotype is, of course, turned out in the usual form of a thin shell of copper; this is then backed with type-metal to the depth required, and trimmed as desired to an appropriate size.

When once an electrotype of this kind has been made, it is possible to produce replicas of it at a very cheap rate, since it has sufficient strength and solidity to withstand all necessary pressure.

When the fossil is itself, as fossils so often are in sandstone rocks, in the form of an external mould of the original, the electrotype may then be made direct from this mould, thus reproducing directly the original form of the animal or plant; but in attempting this due regard must be paid to the composition of the rock matrix, since a calcareous rock must not be placed in the acid solutions of the electrotype bath. The matrix must also be of such a nature that brushing it with black lead to form a surface for the copper deposit will not hurt it; and further, if it is desired to preserve the matrix after the electrotype has been made, the mould formed by it must be of such a shape that the electrotype can be withdrawn from it without fracture.

In the domain of natural history it is obviously chiefly with fossils that good results can be obtained by the electrotyping process. At the same time, it could, if required, be applied to the bones, shells, or any hard skeletal structures of recent animals; and in those cases where the preservation of the original is not of such great account, it can be used for the reproduction of various delicate objects by the formation of a mould through direct deposition of copper on the surface of the object itself. Clearly, electrotyping would be more suitable than casting in plaster for the reproduction of the various metal antiquities, such as those of which

Mr. Rudler spoke at our last meeting. As illustrating the various details to which an ingenious curator might apply the process, I may mention that Messrs. Dellagana do a large business in taking from skins electrotype moulds, which are then used for impressing the characteristic features of morocco, russia, crocodile, and so forth on the cheap forms of leather and leatherette.

As to the practical course to be followed by anyone who wishes to have specimens reproduced in this manner, if the specimen be one that can be allowed to leave the museum, it would be simpler to send it straight to Messrs. Dellagana. If, as in the case of specimens belonging to the British Museum, this cannot be permitted, either the curator himself must make a mould in plaster or wax, and send it to the electrotypers, or Messrs. Dellagana, who have places at Manchester and Liverpool, as well as in London, are prepared to send a practical workman to take the necessary moulds.

As to the cost, in the present incomplete stage of our experiments any general estimate is rather guesswork. Messrs. Dellagana are, however, prepared to undertake the reproduction of flat specimens sent to them at 3d. per square inch, with a minimum charge of 5s. Round subjects would necessarily be rather more. Ultimately the charges may be reduced.

One of the objections to a plaster cast, if it be uncoloured, is its rather unsightly appearance. An electrotype, however, as I think these specimens show, is in itself a thing of beauty. Moreover, it is just as possible to colour these as it is to colour a plaster cast. In the case of electrotype of such objects as the beautiful echinoderm remains in the slates of Bundenbach, or the vertebrate remains in the gas-coal of Bohemia, or any pyritised fossils whatever, a very close approximation to the

original object is obtained by merely darkening the ground and leaving the representation of the fossil itself in the simple copper. As I said at the beginning of this note, and as indeed I am never tired of saying to the various people who apply to us at the Museum for duplicate specimens for teaching or exhibition purposes, a good reproduction of a good specimen, showing the various structural features and diagnostic characters, is of far more value than such an inferior example as alone we could in most cases spare, and in making this reproduction, I venture to think that a large field is open for the electrotyping process.

The present paper is intended as little more than a suggestion, and we hope that before long our results will have come nearer to perfection. For any criticisms or suggestions that may help us on that road we shall be most grateful.

MR. PLATNAUER asked whether gutta-percha would not be a suitable material for making casts, and also whether the powdered plumbago generally used could not be replaced by a better conductor —such as a fine metallic powder.

MR. OGLE (Bootle) said that he had heard that fine silk pressed into the mould took the deposited copper well.

MR. RANKIN said that gutta-percha had been tried in making models of coins, and with great success.

MR. BOLTON (Manchester) advised that electrotypes should be taken of all fossils that were composed of perishable material, such, for instance, as pyrites. He suggested that the fossil to be copied should be bedded in wax before being subjected to hydraulic pressure.

PROFESSOR CARR (Nottingham) said that poor museums could scarcely afford to adopt Mr. Bather's plan. It would be well if museums that had casts made could send them to other museums. And could not the difficulty of lending types be solved by museums lending electrotypes of their type specimens?

MR. JAMES (Maidstone) asked whether the reflecting metallic surface of the electrotype could not be dulled in any other way than by painting.

MR. BATHER said that his want of conversance with the details of electrotyping prevented his answering some of the questions positively. The practical man disliked using gutta-percha, but he could not say why. With regard to the question of superseding plumbago, he knew of no metallic powder fine enough; while the use of silk was objectionable, as it would impress its texture on the electrotype. As to the lending of electrotypes of type specimens, it was open to two objections—(1) the investigator had no clue as to the colour or substance of the original, and (2) the actual specimen could be “developed” or “cleaned”; this obviously could not be done with an electrotype. Reflection from the surface of the electrotype speedily ceased in consequence of the slight oxidation of the surface when exposed to air.

THE PRESIDENT said that the taking of moulds of objects dated back as far as the 13th century in Italy, and the art had been brought to great perfection. He fully endorsed the statement that a cast of a good specimen was far better than a poor specimen.

CHEMISTRY IN MUSEUMS.

BY GEORGE W. ORD, ASSISTANT, KELVINGROVE MUSEUM, GLASGOW.

TO the ordinary man the term Museum signifies merely a place containing curiosities, monstrosities, and freaks, specially gathered together for the purpose of exciting his wonder and amazement, while there are individuals in the community whose conception of the purposes for which museums are intended is even lower—a fact which is evidenced by the enquiry sometimes addressed to museum officers for “the room which is shown to men only.” I believe I am perfectly justified in saying that the necessity of well-equipped museums as an integral part of the educational system of the country has not yet dawned on the imagination of the great majority of the ratepayers. This prevalent misconception of museums and museum work is one of the greatest impediments with which museum officials have to deal. Our main object is, or ought to be, so to arrange all objects placed on exhibition as to obtain the full educational value, shall I say, at the least possible expense. In fact, we lay ourselves out to help, as far as lies in our power, the true student and seeker after knowledge. Herein is the difficulty. The more scientific the collections become the less likely they are to meet the approbation of the general public, the body on which we depend for the sinews of war, and to which in these days, when King Demos rules supreme, Prince,

Premier, and Museum official must alike bow the knee. It has been proposed to remove to the Reference Cabinets all such specimens as require a long descriptive label, to keep these entirely for the use of students, and only to place on exhibition the most striking types. In certain departments this might do very well, but there are others in which it is quite impracticable and where a fully descriptive label is an urgent necessity. Among these must be classed that most neglected of all museum departments—the Chemical collections.

The students of Chemistry are worthy surely of the same consideration as is extended to the students of Zoology, Botany, and Geology; they have even a special claim to notice owing to their being a much more numerous class in the community. In the City of Glasgow the number of students attending the evening classes in Chemistry mounts up into four figures, and in the other large industrial centres of the United Kingdom they are not less numerous. Yet the museums are few in number which devote any considerable portion of their space to Chemistry, and in the case of many of those which do bestow on this science a little of their attention the educational value of the collections is for various reasons almost nil. The principal cause of this neglect of Chemistry is the widely-prevailing opinion that it is impossible to illustrate such a science in museums in the same manner as Zoology or Botany. To a certain extent this may be correct, but a little consideration must convince anyone that it is perfectly possible to show a series of specimens, which, though very inadequately representing a science so vast and complex, will nevertheless be of immense service to the student, and, furthermore, that such a series ought to be in every Natural History Museum. He would indeed be a bold man who, in the last quarter of the 19th century would dare to question the

importance of showing alongside the existing types of animal and vegetable life their prototypes of earlier periods in the earth's history, and surely the "artificial" compounds of the elements have as striking a lesson for the mineralogist as the fossil has for the zoologist.

Another reason for the want of attention shown by museum authorities to the students of Chemistry is the widespread impression that such students can see all they need in the various colleges they attend. This, however, is by no means the case. Educational institutions of that nature are generally much harder pressed in regard both to time and money even than museums, and I unhesitatingly assert that hundreds of students present themselves for the yearly examination of the Science and Art Department, who have never seen many of the substances they are expected to describe. That this is a deplorable state of affairs all must admit, and the remedy lies with the museums, the only institutions at all times available to every member of the community.

In their relation to the science of Chemistry, museums may be divided into three classes—

- (1) Those which ignore it.
- (2) Those which attempt to illustrate merely the principal industrial application of the science.
- (3) Those in which some attempt has been made to treat the chemical collections in a scientific manner.
The arrangement followed in certain of the latter is : (1) World - building Elements, (2) Common Elements, (3) Uncommon Elements, and (4) Rare Elements.

Now, this may be a very convenient arrangement, and it may be defended on the ground that the general public can appreciate it, but from the chemist's point of view it is very defective. No arrangement can be satisfactory which

is not based on the Periodic Law of Newlands, Mendeléeff, and Lothar Meyer; Bromine and Iodine may not be separated from Chlorine, nor Selenium and Tellurium from Sulphur, nor Cobalt and Nickel from Iron, for in Chemistry the natural relationships of the elements are of much more importance than their distribution. Less serious, but still grave defects, are the relegation of the chemical collections to the industrial side of the museum, and consequent separation from the mineralogical department; and the placing of the industrial processes in a section by themselves, instead of in their natural position in the series.

The initial mistake in regard to chemical exhibits is, perhaps, in the method of acquirement. Seldom, indeed, do museums purchase specimens for this department, depending for the most part on the good-will, and often on the caprice, of the manufacturer. Naturally, the latter sees an opportunity of doing a little quiet advertising at very slight expense; in many cases he has strong objections to exhibiting anything that may betray any of the cherished "secret" processes; consequently, the objects prepared for exhibition in museums are got up in order to secure the maximum of advertisement, while giving the minimum of information. Often the donor stipulates that the whole of his exhibits shall be kept together, even though they illustrate widely divergent chemical processes, thus making confusion more confounded. The bottles and other accessories of the Chemical Department are, from the manner in which the exhibits have been acquired, of all shapes and sizes, and the labels are often huge in size and as vulgar as posters on the street hoardings. The first step towards reform must be the recognition of the necessity of removing the chemical collections from the industrial to the scientific side of the museum, and of placing them in their proper position next the Mineralogical

Department. The elements and their compounds must be arranged in scientific order—the more important ones being treated individually, the less important in groups, and the illustrations of industrial processes will then fall easily into their true place. If the space available for the exhibition of such a collection is small, it would be better to sacrifice the less important of these processes rather than diminish the more truly scientific portion of the series; for, after all, the industrial applications of any science are only of secondary importance, and for the purposes of the student, at anyrate, an extensive series of the elements, their modifications and chief compounds, would be of far more value than the heterogeneous masses which at present exist in museums as illustrations of chemical science.

The starting point of the collection ought to be a stand containing as many of the elements as are obtainable, arranged according to the Periodic Law Tables of Mendeléeff or Lothar Meyer, and, along with this, one of these tables, preferably that of Meyer, should be shown. The natural affinities of some of the elements will thus be brought home to the most casual observer, were it only through the means that must be taken to preserve the members of certain groups—the metals of the Alkalies and Alkaline Earths—from oxidation. In the classification of the general series one or two methods might be followed. The elements might either be treated as a whole and arranged in their groups according to the Periodic Law, or, previous to grouping, they might be divided into the two sections of non-metals and metals, which is perhaps the more convenient, and does not imply any violent rupture in the natural relations.

The full illustrative series for any non-metal of importance should consist of—

- (1) Natural source or sources.

- (2) The element and its allotropic modifications where possible.
- (3) Compounds—Hydrides, Principal Oxides and Oxy-acids with examples of Salts—Fluorides, Chlorides, Bromides, Iodides, and Sulphides.
- (4) Methods, industrial and others, for obtaining the element itself and its principal compounds, with illustrations of their applications.

An important metal would be illustrated by—

- (1) The ore from which it is usually obtained, and as many as possible (or convenient) of its other naturally occurring compounds.
- (2) The metal and its chief alloys. Here an opportunity might be found to illustrate the precipitation of certain metals from solutions of their salts. The action of zinc on a solution of a lead salt with the consequent formation of the "Lead Tree" would be a good example.
- (3) Principal compounds—Oxides and Hydroxides, Fluorides, Chlorides, Bromides, Iodides, Sulphides, Carbonates, Nitrates, Phosphates, Sulphates, etc. The precipitation of many of the insoluble compounds might be suitably shown.
- (4) Metallurgy and industrial methods for obtaining the principal compounds.

Care must be taken to acquire good crystals of the various compounds, and cases of di- and tri-morphism should not be forgotten; black precipitated Mercuric Sulphide should be placed alongside the naturally occurring Cinnabar and the artificial Vermillion, and Stibnite and the orange-coloured precipitate of Antimony Tersulphide should always go together.

Preceding each series illustrating an element, its compounds and the processes connected therewith, there ought

to be a large general label giving a fairly full description both of its physical and chemical properties ; and in connection with reactions and processes the importance of numerous illustrative labels cannot be over-estimated. I do not mean that great expense should be incurred in getting up elaborate drawings of manufacturers' plant. Simple diagrammatic representation is all that is required ; the more simple it is the better it will be. In many cases the acquirement of a few Chemical Manuals is all that will be necessary ; a pair of scissors and a bottle of paste will do the rest. In regard to the more important processes a larger illustration may be advisable, but there are usually among the assistants or attendants connected with museums men with a knowledge of drawing, to whom the enlargement of the Manual figures will not be a very difficult task. Many museums employ painters and label-writers, and when vacancies occur in these positions men with a knowledge of such work might be given the preference. It might mean a slight increase in the wages of such officers, but the extra expense thus entailed will be small in comparison with the increased educational value of the collection. I have here the kind of diagram I mean, enlarged for me by our painter in the museum here, from a figure in Professor Newth's "Text-book of Inorganic Chemistry." It is the simplest possible diagram of the plant required in the well-known Weldon Process, usually represented in museums by a series of seven bottles—(1) Still Liquor, (2) Milk of Lime, (3) Neutralised Still Liquor, (4) Weldon Mud before oxidation, (5) Weldon Mud partially oxidized, (6) Weldon Mud—oxidation complete, (7) Calcium Chloride Liquor—the only refuse.

As they stand they give but little information, but with the help of suitable labels and this diagram they could, I

think, be made to convey a good deal. Suppose that the general label was something in this style—

PREPARATION OF CHLORINE.

MANUFACTURING METHODS.

THE WELDON PROCESS.

"Although indirectly a means of obtaining Chlorine, this process is in reality designed for the recovery of the Manganese contained as Manganous Chloride ($Mn Cl_2$) in the liquors of the stills where Chlorine has been prepared by the action of Manganese Dioxide ($Mn O_2$) on Hydrochloric Acid ($H Cl$), and for re-converting it into available Manganese Dioxide. The Manganese Dioxide so obtained is, however, again utilised for the formation of Chlorine by the decomposition of a further supply of Hydrochloric Acid. The process is as follows:—The Still Liquor is mixed with ground chalk in large tanks (*A* in diagram). The free acid is thus neutralised, and the Iron is precipitated as the Hydrated oxide ($Fe_2 (O H)_6$). The neutralised liquor containing the chlorides of manganese and calcium ($Ca Cl_2$) is pumped into large tanks called 'settlers' (*B*). By means of the swivel-jointed pipe (*F*), the clear liquor is drawn off without disturbing the sediment into the oxidizer (*C*), a flat-bottomed iron cylinder open at the top. Into the oxidizer Milk of Lime ($Ca (OH)_2$) is pumped in sufficient quantity to precipitate the Manganese entirely as Manganous hydroxide ($Mn (OH)_2$). Into the mixture of the hydroxides of Calcium and Manganese in suspension a stream of compressed air is forced by a pipe (*h*), which reaches the bottom of the oxidizer. The Manganese is thus oxidized to Calcium Manganite, a compound of Manganese dioxide and Calcium oxide ($Ca Mn O_3$). A further addition is

made of neutral liquor, and steam is injected into the oxidizer, with the result that a portion of the Manganite becomes further oxidized ($\text{CaO} \cdot 2\text{MnO}_2$). When this operation is completed, the contents of the oxidizers are run into tanks called 'mud settlers' (D), where the product settles as a thin black mud, called the 'Weldon mud,' which is ultimately drawn from the settlers into the Chlorine stills for the decomposition of Hydrochloric Acid."

Following this explanatory label, which might be considerably "boiled down," would come the diagram, and then the labels for your specimens would read like this—

- (1) Still Liquor as run from the chlorine still into the neutralising tanks (A); the brownish colour is due to the presence of Iron.
- (2) Milk of Lime as pumped into the oxidizer from the mixer (E).
- (3) Neutralised liquor as drawn from settlers (D) into the oxidizer. The pink colour is due to the manganous chloride, previously masked by the presence of iron.
- (4) Precipitate obtained by the action of the Milk of Lime on the manganous chloride.
- (5) The same partially oxidized to Calcium manganite.
- (6) The same fully converted to "Weldon mud."
- (7) Calcium Chloride Liquor the only refuse.

The space occupied by the series would not be appreciably increased, as the diagram could in most cases be fixed on the back of the case, whilst for educational purposes the value would be greatly enhanced. I do not mean that such diagrams should in any way replace models or even drawings of the full plant required in the process, but only that they should be used as a help towards the understanding of such models and drawings, which from their

complexity are often very confusing. I have seen a model representing all the various operations of the "Leblanc Soda Process," the ramifications of which would give anyone who attempted to follow them a headache.

I am perfectly well aware that such a collection as I have suggested will be a very inadequate representation of Chemical Science. The great branch generally known as Organic Chemistry has been left out altogether, and I am afraid that I must leave the arrangement of the Carbon compounds to someone with greater knowledge than myself, but I should like to say a word or two in regard to Chemical theory. No museum ought to be without a full series of models illustrating the systems of crystallography and the principal forms and varieties belonging to each, vitally important alike to the chemist and the mineralogist. Little difficulty should be experienced in illustrating dimorphism, isomorphism, and isodimorphism. Models illustrating the valency of the elements and the stereoisomerism of the tartaric and lactic acids can be procured at very slight expense. And is it too much to ask that every museum should contain the three principal forms of apparatus used in the determination of vapour density, the apparatus invented by Beckmann for determining the freezing points of solutions, Graham's diffusiometer, the absorptiometer, Pfeffer's endosmometer, the voltameter, the eudiometer, and models of the apparatus used by Dumas and others in their investigations into the gravimetric composition of water, of such vast importance on account of their bearing on the atomic weights of the elements? Where neither full apparatus nor model is available, the illustrative label can again be used with considerable advantage. The whole history of the liquefaction of gases from the bent tube of Northmore and Faraday to the complicated processes of Olszewski and Dewar could be told in a few simple diagrams.

Many objections can be urged against this method of dealing with the chemical collections. In the first place, there are important elements and compounds which from their very nature cannot be exhibited, and others are so rare as to be unobtainable. Such substances as fluorine, hydrofluoric acid, and chloride of nitrogen must be given up as hopeless. As to the common gases and clear liquids, it would seem questionable if bottles purporting to contain them would be of any service. For my part I do not see that a glass jar or tube said to contain oxygen is of less importance than a metal tube said to contain chrome yellow, or a series of bottles of aniline dyes, the contents of which are entirely hidden by a manufacturer's label. Great was the interest taken in the tubes of Argon exhibited by Professor Ramsay at the now historic meeting of the Royal Society. Grey-bearded veterans of science gazed at them long and lovingly. Oxygen is of as much interest to the tyro as Argon to the veteran; why should he not also be privileged to gaze upon the tube in which it is contained.

Two further objections that may be urged are the loss of the support of the manufacturers, and, as I have already pointed out, the uninteresting character of such a series to the general public. That many of the present donors of such specimens will object to having them scattered to all points of the compass goes without saying, but chemists, manufacturing or otherwise, are not a narrow-minded body of men by any means, and the best of them will no doubt come to recognise that the advertising element should never have been introduced into such institutions at all. Besides, we ought to obtain help from the laboratories of our great educational establishments, and from those of private chemists, and here it was and not in the great chemical works that the science of chemistry was built up.

To relieve the monotony of the cases to the general public a few rings of alum, crowns of dichromate of potash, and crystalline masses of copper sulphate and ferro-prussiate of potash, etc., might be strewn about; but until the education of the people has reached a higher standard, I am afraid that the chemical department as regards popularity will be a failure.

The suggestions I have laid before you may but imperfectly deal with my great topic, but if I have succeeded in drawing your attention to this important subject, and in inducing you to incorporate in your mineralogical collections a few of the more important artificial compounds of the elements, I shall at anyrate have done some little good.

MR. PLATNAUER (York) said that in spite of the ability and eloquent advocacy of the paper just read, he still failed to see that there was any place for Chemistry in an ordinary museum. He considered that museums should confine themselves to the illustration of such branches of Science as required, at least in their early stages, simple observation. The proper place for the illustration of experimental sciences and the display of apparatus seemed to him the collegiate or university museum. There was one objection to Mr. Ord's scheme that seemed to him fatal, and that is that the incessant change in the processes of chemical manufacture would compel a museum curator either to be perpetually engaged in altering his cases or to lag behind the times. But though it might be impossible to put Mr. Ord's scheme into execution as a whole, his paper contained several very valuable suggestions. The exhibition of a series of elements, especially of those entering largely into the structure of the earth's crust, was an instructive adjunct to a collection of minerals. It was also an excellent plan to put artificial compounds side by side with minerals having the same composition. And artificial crystals were very useful as illustrations of crystallography, especially in cases where good natural crystals were rare and expensive. Mr. Ord's scheme, however, could not be considered complete till it included Organic Chemistry.

MR. OGLE (Bootle) said that he had at a previous meeting pointed out the advisability of having a series of elements placed with a mineral collection. The only obstacle in the way was the difficulty of keeping many of the elements unoxidized.

DR. DYER considered the practical difficulties in the way of applying Mr. Ord's scheme in ordinary museums all but insuperable. It would be found almost impossible to keep pace with alterations in chemical processes, and we should ultimately retard Science by exhibiting antiquated methods. All that should be aimed at was the illustration of chemical theory.

MR. W. WHITE (Sheffield) said that a plan of making a chemical museum had been considered before. Mr. Ruskin and Professor Dixon had spent some time in trying to work out a satisfactory scheme.

MR. ORD said in reply that he had throughout insisted that the broad principles of chemical science should be illustrated. With regard to Organic Chemistry, he had omitted that simply because he felt himself incompetent, from want of sufficient knowledge, to deal with it. But a satisfactory scheme could easily be evolved by anyone conversant with that branch of Chemistry, and such a scheme would supplement and complete the one he had laid before the meeting. He repeated that it was a standing reproach to Chemistry teaching that the pupil often had no opportunity of seeing substances which he was expected to describe at examinations. This could be remedied by the carrying out of some scheme such as the one he had been proposing.

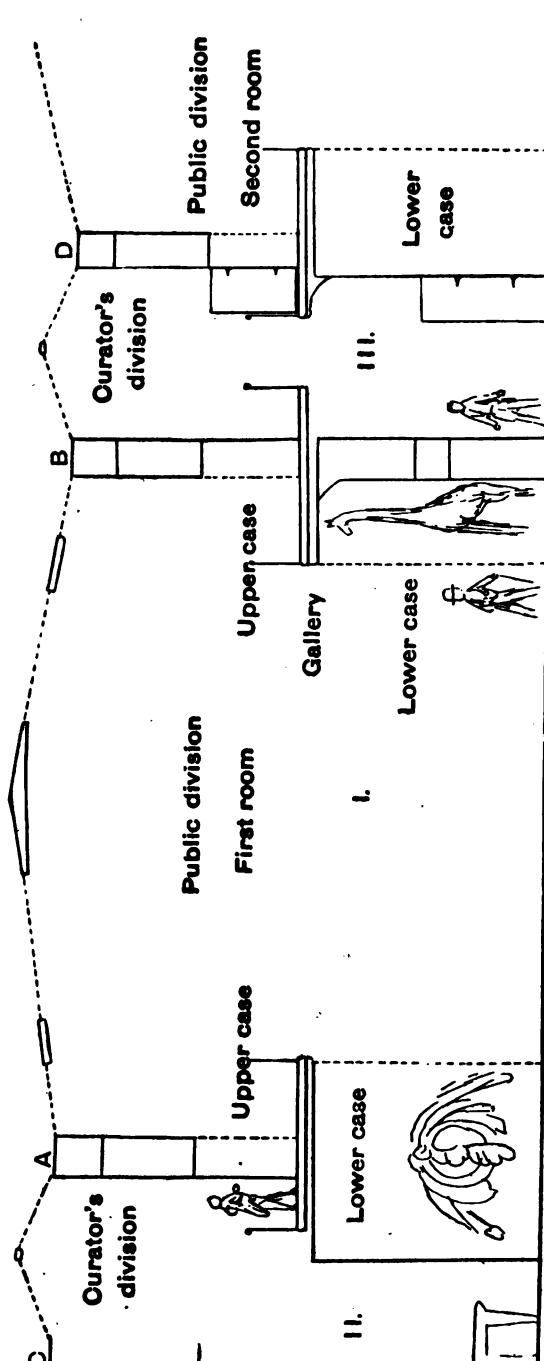
SUGGESTIONS FOR A PROPOSED NATURAL
HISTORY MUSEUM IN MANCHESTER, by
the late Right Hon. T. H. HUXLEY.

CONTRIBUTED BY W. E. HOYLE, M.A., MANCHESTER MUSEUM.

I UNDERSTAND that it is the desire of the Commissioners of the Manchester Natural History Society that I should suggest a plan for a Natural History Museum, and its appurtenances sufficient for the custody and display of an ample collection, in such a manner as may be most serviceable to the public and to students of science.

The most important objects to be attained by a Museum of this kind are—

- (1) The public exhibition of a collection of specimens large enough to illustrate all the most important truths of Natural History, but not so extensive as to weary and confuse ordinary visitors.
- (2) The accessibility of this collection to the public.
- (3) The conservation of all specimens not necessary for the purpose defined in a place apart.
- (4) The accessibility of all objects contained in the Museum to the Curator, and to scientific students without interference with the public or by the public.
- (5) Thorough exclusion of dust and dirt from the specimens.
- (6) A provision of space for workrooms, and if need be lecture-rooms.



Should be somewhat
wider in proportion.

FIG. 1. SECTION ACROSS MUSEUM.

The means by which these objects may be obtained are in principle extremely simple—

- (1) The exhibited specimens must form a carefully selected typical series illustrating the principles of Natural History upon a uniform and well-considered plan.
- (2) The cases in which these specimens are exhibited must present a transparent but hermetically closed face, on one side accessible to the public, while on the opposite side they are as constantly accessible to the Curator by means of doors opening into a portion of the Museum to which the public has no access.

In practice these principles may be carried out in the manner shown in the accompanying rough sections.

Fig. 1 represents a section of a room (I.) 40 feet in width clear from the wall *A* to the wall *B* about 30 feet high, and lighted from the roof. Parallel with this run two rooms (II., III.) bounded by the walls *C* and *D* on the one side, and by *A* and *B* on the other. These need not be more than 12 or 14 feet wide.

The wide room (I.) may be called the "Public division," and the narrow ones (II., III.) "Curator's division" of the Museum.

The walls *A* and *B* should consist of a series of arches of between 40 and 50 feet span, each supported on pillars or piers at least 15 feet high (Fig. 2).

Girders passing between the heads of the piers, and, if necessary, from there supported from the arches should bear a gallery projecting 5 feet into the public division, and 3 feet 6 inches or thereabouts into the Curator's division.

This gallery should support (between every pair of piers) a case about 6 or 7 feet high and 2 feet deep, with

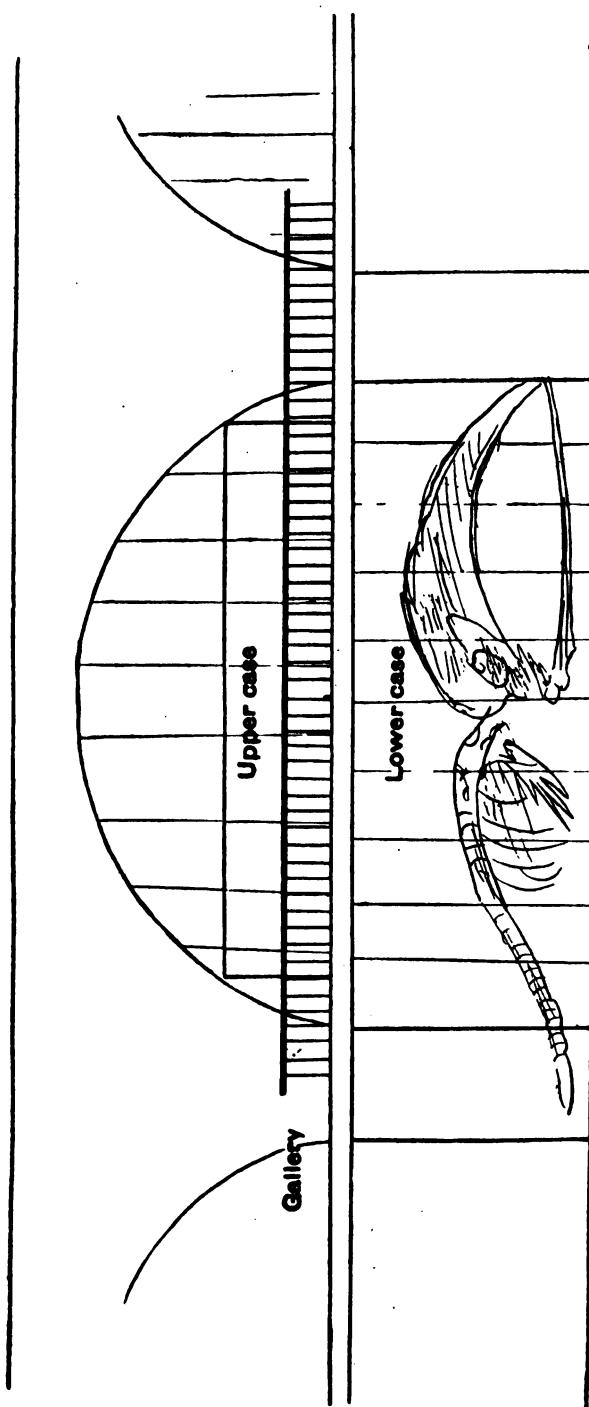


FIG. 2. ELEVATION OF WALL A OR B.

45 feet.
Whale 60 feet long.

a completely closed glass front looking into the public division, and with doors behind opening into the Curator's division.

Shelves on which specimens were previously arranged would slide into these cases from the Curator's division.

Beneath the gallery and nearly in contact with it, but having an independent roof, would be a large case with a perfectly closed glass front (like a shop window), 15 feet high, towards the public division ; the back of the case would have doors at convenient intervals opening into the Curator's division, and might ordinarily coincide in position with the faces of the piers, which would give the case a depth of 5 feet. But, if necessary, for a very large animal like a whale (or its skeleton), the back of the case might protrude into the Curator's division for any distance.

By this arrangement the space in the cases becomes elastic, while the face turned towards the public retains its uniformity and regularity.

The space above the gallery case should be filled up so as to permit of no communication between the Curator's and the public division.

By such an arrangement as I have sketched out the public might have access to the collection every day, and all day long if it were necessary, without interfering with the Curator in his work of arrangement, or with scientific students who could be admitted to the Curator's division every day and all day long. The collection would be completely protected from the dust raised by the visitors of the public division, as every specimen, large or small, would be shut out from that division by a fixed glass screen. The public division might be lighted with gas without doing any harm to the specimens. Abundant space for storage of duplicates and of working collections would be afforded by the Curator's division, which could also be

divided into appropriate work rooms, and, if necessary, placed in connection with a lecture theatre.

I conceive that two public divisions such as I have described, each 350 feet long, separated and surrounded by the Curator's division, would accommodate a very fine and sufficient series of illustrations of recent and fossil Zoology, Botany, Mineralogy, and Stratigraphical Geology.

I should propose to arrange the Vertebrata in the lower cases, as well as the illustrations of Physical Geography and Stratigraphical Geology. The Invertebrata—the Botanical and Mineralogical specimens—could all be conveniently disposed in the galleries.

The floors might be left quite clear except a double row of seats with a common back in the middle of each public division, which would be convenient for rest and would at the same time invite regular circulation of the visitors.

The total area for exhibition purposes of the Museum proposed would be more than double that offered by all the cases in the present Museum.

The illustrations are pen-and-ink copies of Huxley's own sketches.

JERMYN STREET, 25th May, 1868.

A VISIT TO MISS T. MESTORF, Directress of the
Schleswig-Holstein Museum of National Antiquities
at Kiel, by CLARA NÖRDLINGER.

CONTRIBUTED BY W. E. HOYLE, M.A.

IT is impossible to stay any length of time in Kiel or its neighbourhood without hearing Miss Mestorf's name mentioned in connection with the Museum of National Antiquities, and on my visit to this Museum I was naturally anxious to try and obtain an interview with this interesting lady. To my question whether Miss Mestorf would be at liberty, the custodian, who answered my ring at the door of the old University building, where, since 1877, the Museum has taken up its quarters, replied: "Walk upstairs to the workroom, please," and without further ceremony I found myself tapping at a door on the first floor simply inscribed "Arbeits-Zimmer." A gentle voice called, "Come in," and I entered. Miss Mestorf was seated at her writing-table littered with pamphlets and papers, but she turned to greet the intruder with a very pleasant smile and we were soon chatting comfortably. She has only been directress of the Museum since 1891; until then she filled the position of custodian, and "you see there was no one else who knew about things, so I stepped into the place quite naturally," she added, modestly.

To my question as to how she originally prepared herself for the work: "By private study and practical experience,"

she answered. "There is so much to be done ; I still superintend the manual labour myself," she said, pointing to the square table in the centre of the room, where basket work, fragments of stone and metal, etc., were set ready to be examined. "I attend to the correspondence—the literary and financial department—myself, and I think I may say that I consider an extensive knowledge of languages and manual dexterity the most necessary qualifications for this branch of museum work, always providing there is the necessary foundation of enthusiasm and interest in the subject. Of course, good health is another consideration. How often I have been out in all weathers to superintend or take an active share in excavations. You know handling a spade is not quite so simple an art as it may seem!"

"Do you think that women would do well in this career?" I asked. "Oh ! I do not advocate women's rights at all!" the little lady hastened to interpolate. "When I was young, girls were content to remain at home, but I suppose it's different now," with a sigh. "Though in Germany we are so far behind in University training for female students, I must say I am in favour of women adopting the medical profession. It would be a blessing for their sisters, who would be spared many an illness if they consulted a physician about the little ailments they shrink from exposing to men. But no women are admitted to the Kiel University lectures."

"And have you no Museum lectures which women might attend?" "Oh, dear no ! I sometimes show classes round the Museum and demonstrate at the various showcases, but that is all. Perhaps you would like me to take you round ?" "I should be delighted."

Thereupon we left the workroom, which certainly deserves its name by reason of its unadorned simplicity and perfectly utilitarian arrangements. A map of

Schleswig-Holstein is the only decoration. There are no little feminine touches in the room; nothing to indicate the sex of the director who works here, except the bonnet and cloak lying on the table. The windows look upon Prince Henry of Russia's official residence—the "Schloss"—and I was glad to note that a few green trees are visible from Miss Mestorf's place at her writing-table.

She herself is a small, extremely neat-looking little lady in a simple black gown, fastened at the throat with a pretty antique coin brooch. She is no longer young; her expression is grave and thoughtful, the forehead broad, with parted hair falling low at either side, the eyes light and very clear; the firm mouth would be almost stern if it were not for a very sweet smile which occasionally lights up and transforms the whole face. Her voice is very sympathetic and low, but once among her treasures she waxes enthusiastic, and "Come, let us see the Nydamer boat," she says, as we mount to the attics where this treasure is preserved.

"It was probably in such a long boat as this that our common ancestors crossed to Britain, but you see it was useful for river work as well as in the open sea. It is equally pointed at either end, and can therefore be propelled forwards or backwards without turning, the rudder hangs at the side; notice, too, how the rowlocks are simply bound down, so that they may be turned either way, and how flat the keel of the boat is to facilitate landing or navigation in low water. Do you see that the supports of the seats are hewn out of the same piece of wood as the planks, instead of being affixed afterwards? Yes, the boat was found in the Nydam bog, where we unearthed such countless treasures. Let us go down to the next floor and look at some of the exhibits there."

Hardly had Miss Mestorf begun to initiate me into the

mysteries of broken iron spears and sword-blades, quoting the historian Orosius, who explains how the ferocious barbarians destroyed all booty and offered it as a sacrifice to the Gods, than a visitor was announced, and I had the pleasure of hearing the lady director converse with the learned Herr Doktor on various interesting subjects. It was, however, notably the lack of funds to support the investigations now going on at Torsberg that occupied the two enthusiasts, who seemed quite downcast that others should not place blind confidence and gladly sink their money in the work. When the Herr Doktor had gone we continued our examination of the Museum cases. Here was the skeleton of a man, whose corpse was discovered in such perfect condition that murder was conjectured, and a medical enquiry ensued. The body was dissected, and there followed the announcement that these human remains had probably been lying buried in the bog for several centuries. The man may have originally been consigned there as a punishment for some serious misconduct or breach of discipline. The clothes are still in perfect order, and Miss Mestorf is very fond of pointing out a careful darn in one of the garments. Another large case contains various articles of rude attire, among others a garment somewhat resembling modern combinations with stocking feet attached.

“ Do you know that your English word hosiery is derived from this garment? It is not an equivalent of the German ‘hosen’ (breeches), but of ‘haas,’ the low German word for stockings, which, as you see, were formerly a continuation of the upper garment.”

As we pass from room to room and case to case, Miss Mestorf points out household and warlike implements, ornaments of all kinds, fishing nets and tackle, which have all been found in various bogs. Then there are the

manifold, strange, and beautiful objects found in ancient graves ; here a little pair of pincers for extracting thorns, the ointment box beside them, coins of all sizes and ages, chains, metal belts, and clasps of lovely filagree work, vases and urns of all descriptions. In another room Miss Mestorf delights in showing her visitor a most interesting exhibit.

" You see these coins ; they were probably buried in this broken earthenware vessel, and they clearly demonstrate the difference between the currency of the Franks and that of the people of Holstein. The former had a regular system of coinage, the latter paid their way with bits of silver of all shapes and sizes. Bars, jewellery, or foreign coins were hacked up (hence the name Hacksilver) and broken into fragments which were weighed on scales, so that the size might be adjusted to the need of the individual debtor and creditor."

Pointing to a pretty gold arm-band, Miss Mestorf told me the following little story :—" One night the hut of a poor peasant was destroyed by fire ; next morning as he was disconsolately shovelling among the charred remains, he came across this bit of glittering gold. He carried it to the village schoolmaster who sold it for him, and the sum it fetched more than sufficed to rebuild his ruined home."

But time is apt to fly in such interesting company and among such delightful surroundings, so, mindful of the writing-table I had seen piled up with papers and documents, I bade my kind hostess adieu at the door of her workroom. A few minutes later I was passing a flower shop in Kiel, and the contrast between these fragrant roses and lilies and the dry, lifeless objects I had just been inspecting, struck me so forcibly that I hastened to choose a bunch of glorious dark red roses to adorn that severe "Arbeits-Zimmer" in the Museum. A few numbers of "Punch," containing the

well-known delightful "prehistoric peeps," seemed to me the most appropriate addition I could make to the valuable collection under the care of the famous lady director at the Kiel Museum of National Antiquities.

MR. HOYLE added at the close of the paper that he considered museum work a suitable field for the employment of women. There was no museum work which women could not do except, perhaps, the mounting of heavy skeletons or other specimens requiring great physical strength. He had employed female work in the Manchester Museum with marked success. For some time past all the labels used in the museum had been printed on the premises by a lady.

MR. HOWARTH (Sheffield) commented on the agreeable style in which the paper was written. It also had the additional merit of raising the question of the employment of women in museums. This was a subject on which Mr. Hoyle could speak with the authority of experience. His own experience of female work in the museum at Sheffield was not of a wholly encouraging nature. A lady had been employed in the museum for a short time on label painting. She had done the work well, but she got married and left. A second lady had come to continue the work, but they found that though she could paint labels, she could do no other kind of work that was of any use in a museum. With regard to a printing press, they had had one for some time in Sheffield and had found it very useful.

MR. HOLMES (Pharmaceutical Society) said that ladies had been employed in the Kew Museum, and with marked success. He would be glad to know what kind of printing machine was most suitable for a museum.

MR. BATHER (British Museum) said that Miss Mestorf was not the only lady curator, Miss Mary Holmes in the United States had filled the office with distinction. Certainly if women could do good work in museums they should be employed. He himself could testify to their expertness in cleaning fossils. But they must not expect scientific work from women who had not had scientific training.

MR. HOYLE said that a good second-hand press could be obtained for £5; type could be got from time to time in small quantities; a complete outfit of type would not cost more than £10. In his own experience he had found women work well and for a moderate

remuneration. With regard to Mr. Howarth's difficulty in the case of his second lady assistant, he had believed that it was quite possible to secure the help of ladies who had had some scientific training. He further added that he had been as fortunate as to receive a large amount of gratuitous help from several ladies interested in different branches of natural history.

The PRESIDENT said that the paper was very pleasantly written, and that the importance of the question it raised quite justified its appearance. In his experience he had found that women could clean specimens with a neatness and care which were rarely found in men, and they did their work at a much lower rate. Indeed, he considered them decidedly underpaid.

ILLUSTRATED LECTURES IN ART GALLERIES AND MUSEUMS.

BY THOMAS RENNIE, ASSISTANT, CORPORATION GALLERIES
OF ART, GLASGOW.

AMONG the causes which have operated to delay and obstruct the progress of Art, and which, to a large extent, account for the lack of appreciation of it by the people of Scotland, three may be singled out as the most prominent—(1) the struggle for existence with an unkindly soil and a rigorous climate, (2) the adoption of an austere religion, and (3), and most recent, the extraordinary development of mechanical industrial activity. The first cause has been in a great measure overcome by the hardihood and energy of the people; the second is, unless in the more remote and inaccessible regions, rapidly disappearing; but the third still remains with us, and in all probability will go on increasing and intensifying. We can only hope that in time, and as the vigorous efforts now being made to arouse a taste for artistic productions bear fruit, the limits of mechanical production may be defined and insisted on, and while no restraint is placed upon the legitimate expansion of mechanical appliances, they may be prevented from encroaching upon the province of Art.

In most cases, perhaps in all, the direction of the activities of a people is the natural and inevitable result of situation and environment. Glasgow, for instance, situated in a district of enormous mineral wealth, and having free com-

munication with the sea, has developed in her inhabitants a special capacity for mechanical invention and construction, and for commercial enterprise, to such an extent that the comparatively insignificant city of a hundred years ago is now one of the most important industrial and commercial centres of the world. It is not surprising then that the citizens of Glasgow, devoting their energies entirely to the development of their mechanical industries and the expansion of their commerce, have hitherto taken no interest in art beyond perhaps the grocer's calendars and the china dogs which ornament the humble abode, or the gilt frames characteristic of the more pretentious one. There are signs, however, that this apathetic attitude is undergoing a change, under certain favourable conditions. There is a vast difference in the conditions of life in Glasgow at the present time compared with those existing a generation or two ago. Wages are higher, hours of labour are fewer, the general standard of comfort is raised, means of outdoor recreation are provided and largely taken advantage of, and sanitary science has done much to improve the general health. Dismal as the city of Glasgow is at times, it is fortunately surrounded by scenes of great natural beauty, to which the citizens have now access, and to which they are by no means insensible. It is not credible that a people, the majority of whom are in the enjoyment of health and comfort, who have abundant leisure, and who are possessed of a love of natural scenery, can remain for ever insensible to the charms of art, if, as is now the case, opportunity and encouragement are afforded them.

At the same time Glasgow has not been without artists and art lovers; but love of art has never been a characteristic of its people. As a consequence there are the singular anomalies of a general indifference to art, in the midst of which there has arisen a school of painters whose fame may

truly be said to be world-wide; and the formation by an isolated enthusiast of an art collection of supreme importance. The rise of the Glasgow School of Artists is one of the most remarkable events in modern art history, not only because it has dared to arise in this grimy and inartistic city, but because of the influence which it is exercising and will continue to exercise over contemporary art. In addition to the works of permanent value which the artists composing it have produced, the spirit which animates their work, their long struggle with and ultimate victory over a stifling conventionalism, will be remembered as an example and an encouragement to every artist to avoid the slavery of tradition and imitation, and while learning all that the past can teach, still remain true to his own art instincts. The formation of the M'Lellan collection of pictures is an instance of how much can be accomplished by an enthusiast in the midst of the most depressing surroundings. As the President has pointed out to you in his opening address, it was the nucleus and, after thirty years, is still the most important of the various collections which have been acquired by the Corporation of Glasgow. He has also told you of the public neglect under which this institution languished during many years. What I have to direct your attention to is one of several efforts which have been made to raise the collection of art treasures within these walls to the place in public estimation which its importance deserves. The success attending that effort warrants me in bringing it under your notice. For some time it had been perfectly well known in art circles that these galleries contained many works of permanent value, but the average citizen remained unconvinced, and the fact was that the importance of the collection was recognised abroad long before it was acknowledged at home. This being the case, it became evident to those in authority that if Glasgow was not to become

a by-word and a reproach its attitude towards its art possessions must undergo a change. To assist in effecting this desired change an effort was made to educate local opinion upon art by a yearly series of illustrated lectures.

Previous to this venture public Art lectures in Glasgow had been few and far between. An occasional lecture on "Art and Religion," "Art and Morals," "Art and Culture," or some such high-soaring and far-reaching theme might have been given, and probably enjoyed by a select few, but there was no apparent result accruing, no indication that anything had been said which influenced the public in the smallest degree in connection with Art. And this was not surprising. Such lectures treated of Art in relation to something else, and had really nothing to do with Art as Art; with its distinctive features as a particular form of human activity. The lectures given in the Galleries, on the other hand, although not systematic, had for their aim the informing of the public mind concerning matters strictly artistic. What considerably influenced the Committee in making the experiment was the appreciation with which a lecture delivered in April, 1891, by Mr. Newbery of the School of Art, on the "Language of Pictures," illustrated with lantern views, was received. As stated in the Museum and Galleries Report for 1891, "The lecture was so well attended and so highly appreciated that it at once became obvious that a series of similar lectures on Art subjects could not fail to be beneficial to visitors to the Galleries, and add much to the public interest and usefulness of the collections." Accordingly, an experimental course of six lectures, with lantern illustrations, was arranged for the winter season of 1891-2. The subjects chosen were—"Technical Processes in Art," "Corporation Art Treasures—Dutch Pictures," "The Sculptures of the Parthenon," "The Architecture of Egypt, Greece, and

Rome," "Sir David Wilkie" and "Landscape." The experiment was almost too successful, it being found impossible to accommodate the numbers seeking admission. Since then a yearly course of ten fortnightly lectures has been given on the Saturday evenings. The success attending them has been most gratifying. Without exception the lecture-room was crowded to its utmost capacity, while on many occasions it could have been filled several times over. They have been attended by "all sorts and conditions of men" and women, and, most gratifying of all, by large numbers of the working class. The audiences were most orderly, intelligent, and appreciative, and one noticeable feature was the regular attendance of large numbers. A specially successful course was that of 1893-4 on "Art Industries," in two of the lectures of which —those on Pottery and Bookbinding—demonstrations of the processes were given by the employees of the lecturers. Each series of lectures was, as far as possible, illustrated with slides made from the pictures and specimens contained in the Corporation Galleries and in Kelvingrove Museum. As has been said, no systematic arrangement of subjects has yet been attempted, and it is an open question whether the public would be attracted or repelled by the undertaking of a more severe and methodical course. Such a method would undoubtedly meet with the approval of the more serious-minded, and a series of lectures dealing yearly with the art of one single country or period might be attempted, now that the ground has been in a measure prepared.

The chief lesson learned from five years experience of Art lectures is, that there exists in the community a sincere and wide-spread desire to learn something of Art, of which advantage should be taken; that the time has come when the public are prepared to be enlightened as to the meaning of Art, as to its history and development, and

as to the cause of its persistent appearance wherever civilisation exists—subjects of the utmost importance in connection with Art education. The existence of such a desire is evidenced not only from the larger attendance at the lectures, but from the increase in the daily attendance at the Galleries since their inauguration. The Galleries are surely and even rapidly taking their place as one of the favourite resorts of the citizens, and there is abundant reason to believe that the newly-awakened interest is an intelligent, and will be a permanent one. For the five years previous to the commencing of these lectures the visitors to the Galleries were—In 1886, 60,048 ; in 1887, 62,713 ; in 1888, 72,256 ; in 1889, 66,471 ; and in 1890, 88,260. The exceptionally large number of visitors in 1888 and 1890 is accounted for in the year 1888 by it being the year of the Glasgow International Exhibition, when there was an enormous increase in the number of people attracted to the city, and in 1890 by the special attraction in the Galleries of the Arts and Crafts Exhibition. For the five years during which the lectures have been in progress the visitors numbered in 1891, 80,180 ; in 1892, 95,053 ; in 1893, 108,878 ; in 1894, 126,235 ; and in 1895, 127,038. Thus, making allowance for the extra visitors attracted by the International Exhibition, and the Arts and Crafts Exhibition, the number of visitors for the last five years is nearly double that of the previous five ; while there is an actual increase on the total visitors of 187,636. Figures could scarcely be more significant.

I do not know whether any similar course has been followed by any of the institutions represented here. If not, I would strongly urge the attempt to be made, not only in connection with Art collections, but with those of Natural History, Archæology, etc. It is a great matter to get people interested in subjects at present beyond and

above the circumstances of their daily lives, but subjects which, with diligent nursing, might ultimately become part and parcel of them. Much has been done in recent years in improving the methods of labelling and describing specimens, but improvements in these directions mostly appeal to those already interested. The great majority of people will not be influenced in any other way than by speaking directly to them. Much good can be done by taking visitors round and describing specimens, but even then the number who can get within reach will be limited.

Every Art Gallery and Museum ought to have its lecture room, its camera, its lantern, and its collection of slides, to which it should constantly be adding. In connection with our lectures here, 1,500 slides have already been accumulated.

The lectures should, as far as possible, be undertaken by specialists, by men familiar with their subjects from top to bottom. An enthusiast will rarely fail in conveying something of his own love of his subject to his audience.

The number of slides shown should be strictly limited to the requirements of the lecture. A constant succession of views embarrasses the lecturer, and overtaxes the memory and distracts the attention of the audience. The so-called popular lecturer with his innumerable slides and his hour and a-half of platitudes and funny stories is to be avoided as the plague. Illustrations, if kept in due subordination, are valuable aids to lectures. They obviate the necessity of removing pictures from the walls or specimens from the cases, proceedings which are highly inconvenient and not a little dangerous. A case with its contents can be photographed, thrown upon the screen and described, and, at the conclusion of the lecture, the originals are available for inspection. The lantern of course has its limitations ; but in illustrating lectures on Sculpture, Architecture, Pottery

and the like, it is invaluable. In illustrating lectures on painting, beauty of form, and variety and dignity of composition can alone be shown, the colour treatment must, in the meantime at least, be left to the descriptive power of the lecturer, who can, however, refer his audience to such pictures in the collection as will substantiate his teaching.

The minor arrangements should be carefully attended to. A proper understanding should exist between the lecturer and the operator. If the light is turned off or on at the wrong time, the wrong slides thrown on the screen, or, as sometimes happens, slides are shown upside down, the audience will go away probably more amused than instructed.

The slides should to a large extent consist of specimens belonging to the institution where the lectures are being delivered. They should be carefully numbered, labelled, and indexed, so that a selection can be made on the shortest notice. And they should be available for loan purposes to kindred institutions.

I may add that no charge for admission is made to lectures delivered here, and no fee is paid to the lecturer. So that the cost is trifling in comparison with the result achieved.

I cherish the hope that popular illustrated lectures will soon be considered indispensable in every Art Gallery and Museum possessed of the necessary facilities, and I am confident that they will prove of great educational value, and add much to the popularity of such institutions ; at the very least they will occupy, in a pure and healthy way the, at present, vacant leisure of many.

MR. OGLE (Bootle) asked if acetylene had been used for the lantern in connection with the lectures of which they had just heard. He was desirous of knowing if the gas was manageable as an illuminant, and if it gave a sufficiently strong light.

MR. W. WHITE (Sheffield) said that there were often difficulties in the way of getting lectures. A suitable room is essential, but many museums have no such room at hand. Committees often fail to see the use of lectures, and therefore refuse to make grants for payment of lecturers. Lantern slides, too, are necessary adjuncts, but they are costly. But in spite of all difficulties, every curator should strive to have lectures in connection with his museum, for nothing is more effective in furthering museum instruction.

COUNCILLOR BILSLAND said that they had experienced the want of a good lecture room, for the room at present used was unsuitable. This defect would, he was sure, be remedied in the new Art Galleries in Kelvingrove Park. He believed that there was no way of leading the people of great cities like Glasgow to appreciate and take an interest in art save by giving illustrated lectures on Art subjects. Their experience in Glasgow had shewn how thoroughly people of all classes in that city appreciated such lectures.

MR. RENNIE said that he could give no information on the use of acetylene as a lantern illuminant as he had no experience whatever of its use. As the ordinary means of lighting were accessible and satisfactory, they had been at no pains to make experiment. Lantern slides are, it is true, a somewhat expensive item at first, but as they accumulate many can be used again and again in different lectures.

THE PRESIDENT said that by lectures alone could they reach and interest the bulk of the people. Going round the collections with parties of visitors was dreary work, it could only be applied to a comparatively small number at one time, and it tended to degrade the curator to the level of a cicerone. Some years ago a series of lectures were given in Edinburgh, mostly by university professors; these short courses were of a thoroughly popular nature, but they fairly covered the range of the subjects they treated. They were very well attended, and he could not understand why they had been discontinued.

THE LIGHTING OF MUSEUMS.

BY THOMAS WHITE.

MUSEUMS, perhaps more than most other places, are dependent upon light for the due and proper appreciation of their contents by the variously gifted individuals who for pleasure, recreation, curiosity, or culture enter these rapidly expanding temples of the severer muses.

Of course the true meaning and purpose of the objects in a museum can only be adequately elucidated by means of the mental rays, which so abundantly and brilliantly sparkle forth from the gifted and highly-trained officials, who so successfully unravel the hidden mysteries abounding in the realms of science and art as to render them appreciable to the intelligence of even the most lightly endowed.

But, with all the knowledge which the highest mental culture can impart, and all the skill and judgment manifested in the displaying of artistic beauties which the rarest æsthetic taste, combined with the most consummate executive ingenuity, can produce, there are still needed those ethereal vibrations of properly measured length which form—can we call it—physical light, to enable the senses to revel in the wonders so lavishly gathered together in our public museums.

Light all round has hitherto apparently been the aim and object of those to whom this important subject has been entrusted. Now, as matter in the wrong place

becomes dirt, so light improperly distributed becomes a nuisance, thwarting alike the purposes of those who come desiring to have their sense of beauty stirred, and those who, craving after the hidden mysteries of nature and science in inanimate objects, come for purposes of severer study, by dazzling the eyes and rendering anything like minute investigation a painful and difficult task; whilst those whose object is the study of animated human nature, the cultivation of sympathetic companionship or tender sentiment, are equally embarrassed (and may I add embarrassing) by reason of the floods of light which are injudiciously thrown into unnecessary places.

Shady nooks and quiet corners for such purposes ought to be sought in less public places, that the serious, if not even sacred, precincts of the museum be not desecrated by any suspicion of levity. But as one of our poets writes—

“ While a youth is lost in soaring thought ;
And while a maid grows sweet and beautiful ;
And while a springtide coming lights the earth ;
And while a child, and while a flower is born ;
And while one wrong cries for redress, and finds a soul
to answer—
Still the world is young”;

and that being so, there will always be found in it a few obtuse individuals who are incapable of recognising (notwithstanding irrefragable evidence), that the hard facts of science have long since killed all sentiment, and that beauty is simply to be measured by art that requires the most profound training to appreciate. Let the museum, if you will, be lighted by its roof of glass, placed far enough above the tops of the cases containing its treasures, and without any regard for its angle of incidence which will govern the amount of glitter and glare reflected back; or, let the window seats be brilliantly shown up by a clear

plate-glass background, while the cases on the walls between them are in deepest shade. All this in the day-time matters little, for the light in its untrammelled abundance scarce needs regulation. But when daylight has gone, and artificial means of illumination have to be resorted to, is it quite necessary to have a row of glittering gas jets making a blaze of light down the centre of the rooms, or clustered together in masses at certain fixed points, lighting nothing in particular, and dazzling everything in general, while they consume all the vivifying oxygen in the room, thus taking away by lassitude all spirit of improving investigation?

Recognising with the true spirit of science that gas as an illuminant it a mere pretender, its proper functions being connected with heating and with generating force for the working of machinery where water or other power is not available, ought we not to utilise in better ways the clearer, cleaner, healthier light which electricity gives us, than by uselessly and lavishly allowing it to blaze forth in the same manner as we have hitherto adopted with the ancient gas?

Electricity is said to be in its infancy, but science develops rapidly. The dazzling arc lamp, with light so intense that the eye refuses to use it unscreened, with its hissings and snortings, and accompanying fluctuations of rays, has been relegated to its proper place, in lighting open spaces or large buildings for general meetings, having proved itself unfit for use in places of quiet study and deep philosophising. The less assertive and more amenable incandescent lamp, of itself suggests its entire adaptability for revealing the not easily discernible specific character of an animal or plant, as well as for keeping true the colours of a picture; but even this, when used without regard to its proper arrangement

and judicious diffusion of its light, may be laid open to the same objections which characterise other and cruder methods of illumination.

To light a room is a very simple matter, to properly illuminate a case of objects or a picture requires deeper consideration, and in these days the art of displaying art is claiming as much attention from the exhibitor, as, in another sense, the art of concealing art is from the executant.

In the Art Gallery at Manchester some time ago, the committee, impressed with the importance of showing the pictures to full advantage at such times as only artificial light can be used—and these are the only times when many people in these busy days can visit an Art Gallery—spent a considerable sum of money in fixing incandescent lights at a carefully calculated distance from the pictures. This, however, involved the use of a great many lamps, and consequent large expenditure of current; at the same time the good effect was largely destroyed by the source of the light being too prominent, thus producing the dazzling effect to the eyesight so fatal to the possibility of seeing pictures with advantage or pleasure. This led the committee to spend more money and much time in investigations. Some of their number were deputed to visit the principal galleries on the Continent, as well as in London, in order to inspect their various methods of lighting, and to gather all possible information on the subject; and they came to the unanimous conclusion that, as an effective means for displaying pictures, nothing could compare with the system of lighting by means of reflectors which had been designed for various London and provincial galleries, including the Grafton and Goupil Galleries; Messrs. Tooth & Sons, London; Agnew & Sons, London and Manchester; and

now also in use in the Corporation Art Galleries at Manchester and Nottingham, and in many other galleries both private and public. A system which also has the advantage of considerably diminishing the expenditure of current and consequent expense.

These reflectors are an immense improvement on the old-fashioned shapes, and must not by any means be confounded with the round or curved-back reflectors still in use in some places and suitable for certain purposes, for these, while intensifying the light, focus it all in one direction, illuminating in patches, thus causing those places which are out of reach of the direct rays from the reflector to appear in even deeper shade by contrast.

The use of the angle in the construction of reflectors can scarcely be over-estimated, for by it the objections to the old methods can be entirely done away with, and a perfectly equable radiance can be diffused over any given surface.

The advantages of this method will be readily understood by all who care to examine the few specimens here on view, for it will be seen that they are adaptable to almost every necessity and can be used in a variety of ways; being suspended from the ceiling, attached to brackets on the walls, or used as standard lamps, and are so easily adjustable as to admit of the light being thrown upwards, downwards, or at any desired angle, and even, where the design of the building permits, can be inserted into the structure itself. In all cases they can be so used as to cast a bright and steady radiance on the object under investigation without obtruding a single, dazzling ray, or casting a single, dark shadow—the source of light being so concealed and the rays so diffused as to render the effect at once brilliant and restful.

I have already referred to the saving effected by the

use of the reflectors in picture lighting, and although that would, of course, not be regarded by any whom I have the pleasure of addressing, if at the same time the efficiency of the lighting were not greatly increased, still it is a point which is sometimes most considered by those whose opinions have to be consulted. Expenditure is a subject fraught with evil meaning to all financially crippled institutions, and those who have the management of museums naturally desire to reduce it to its lowest point. Speaking generally, if the time which the museum is opened include several hours of darkness per day during three parts of the year, it will be found most economical to lay down plant for the separate use of the building; but whether this be done or not, the cost of current is enormously reduced by the use of reflectors, and the outlay caused in fixing them is very soon saved. This reduction of cost is effected in two ways—firstly, by reducing the number of lamps needed for the effective lighting of the building; and, secondly, by the saving in the candle power of each lamp. Thus one 25 c.-p. light reflected is about equal to five 16 c.-p. lamps, because the use of the reflector does away with all waste of light by saving and intensifying every ray.

It is impossible to describe in detail the variety of ways in which the reflectors may be used in the lighting of museums. The ideal method is no doubt that in which every case is lit separately with a view to displaying its contents to the best possible advantage. But this, like most other ideals, is not easy of attainment—partly on account of expense, and partly also on account of the difficulty of opening the cases to replace broken lamps; and perhaps the most useful method is that in which the general lighting of the building is combined with the illumination of the cases and principal objects displayed. This can be done in a great variety of ways which

may be influenced by taste, expediency, or expenditure. I will not attempt to describe these in detail, but will ask you to kindly inspect the few examples which, by the kindness of your President, are to be seen in the darkened passage near the entrance to the Galleries, as in that way a much clearer idea can be obtained of their use and value. I claim for this system suitability, adaptability, portability, and almost every other kind of "ability," together with a ready means of reducing the cost and increasing the efficiency of the lighting of every building where it is introduced.

MR. HOYLE (Manchester) said that Mr. White had brought before them a very important subject in a very pleasant manner. The Manchester Museum at the Owens College was lighted by gas, with the result that the cases were badly illuminated and the upper galleries rendered useless by vitiated air. One of the first points to which he directed his attention was the abolition of the reflected glare from the glass of the cases. To effect this he had incandescent lights put *inside* the cases. He tried this first in the wall-cases containing fossils, the lamps were put under the sloping shelves on which the fossils were placed. The plan succeeded well, but it failed when an attempt was made to light up the cases containing stuffed birds. He tried the "inverted arc," a system by which light is thrown upwards by an umbrella-shaped reflector under the lamp. This succeeded admirably, the cases being illuminated by a soft diffused light which was so bright that all the labels could be easily read, but no shadow was cast even when the spectator stood between the lamp and the objects under inspection.

MR. HOWARTH (Sheffield) said that the electric light had been introduced into the Sheffield Museum in such a manner as to allow of the cases being lighted from the inside, but had not yet had an opportunity of completing his experiments with it. He was therefore glad to hear of Mr. Hoyle's experiences. He vividly remembered the heat and the disagreeable atmosphere caused by the use of gas in the Liverpool Art Gallery, and had long since come to the conclusion that anyone who desired to preserve pictures or specimens would not, if he could help it, employ gas as an illuminant. Gas has every bad quality—its only good one being that it gives light.

GENERAL NOTES.

At the meeting of the Association held in Newcastle last year was read a contribution from Dr. G. Brown-Goode on "The Principles of Museum Administration"; and afterwards the author sent a reprint of the paper to each member of the Association. To most members he was already known by his contributions to museum literature in the Reports of the National Museum of the United States, and other publications; but a more personal feeling of intimacy was engendered by the direct communication of his thoughts to the Association at Newcastle. It was therefore with a feeling of the deepest regret the news of his untimely death was received. Dr. Goode died in Washington on 6th September at the age of forty-five years. His early death is a great loss, not only to the United States Museum but to museums in general, for he took a deep and active interest in all things affecting their development and well-being.

Many museums belonging to the Association are interested in the Circulation Department of South Kensington Museum, from which they receive interesting loans of objects; and curators are probably acquainted with an agitation that has been set on foot for a re-organisation of that department. Parliament has sanctioned the appointment of a Committee to enquire into the work and administration of the Circulation Department of South Kensington. It is to be hoped that this Committee in the course of its inquiry will consult the Provincial Museums that have received loans from South Kensington, and whose managers can best attest the advantages and deficiencies of the organisation. This is of importance since certain daily papers and one of the Art magazines have set themselves up as censors of the department, obviously without accurate or extensive knowledge of its operations; and if their advice were followed the circulation system would be seriously crippled in its operations. The writers of these articles have so narrow a conception of the spirit of design that they suggest that Art students and artificers should have, as examples for their work, objects belonging only to the branch of industry most practised in their district. Jewellery and plate they say should be lent to Birmingham, lace to Nottingham, cutlery and iron-work to Sheffield, and so on. The result would be that artificers and craftsmen would be made mere copyists, and all originality would be banished.

Heretofore the South Kensington Museum has always readily acceded to the request of any museum for special objects relating to the particular industry of the town, or otherwise, to be included in the annual loan, and the knowledge which they have placed at the service of provincial curators in making their selection has been of the highest value. It would be a pity, therefore, if inexperienced outside influence should so limit the objects of industrial Art to be supplied to each town to its own particular industry, and thus destroy the cosmopolitanism of Art to the student. The study of lace is not of value to the lace-maker alone, for old designs in this material offer most useful suggestions to the art worker in silver, pottery, and other materials, and the same holds good in other branches of industrial art. The chief purpose is to have good design, whatever be the material in which it is shown, and it is in that respect that the advice and direction of the officials of the Circulation Department have been of such immense assistance to museum curators. One grave deficiency certainly exists in the insufficiency of the collections to supply the necessary requirements of the steadily increasing number of museums that are annually making applications for loans, and it is to be hoped that the Treasury will furnish the means to enable the department to maintain and improve its work.

The following note which appeared in *Nature* of 2nd September, 1896, has some interest for museum curators :—

“On account of the great success of the botanical models made by the firm Herrn. R. Brendal, in Berlin, the same firm is now constructing zoological models out of papier-mâché, some of which are exhibited in the Berlin Exhibition this summer. For instance, there is a model of the ordinary house-fly (*Musca domestica*), thirty times life size ; it is very accurately made, and all its parts are beautifully worked and distinct, making it unnecessary to take it to pieces. By means of a small piece of mechanism the spreading of the wings can be demonstrated. There is also exhibited, in a series of eight models, a plaster representation of the development of the frog, each being ten times life size ; they are all so arranged that they can be lifted off their supports and examined more minutely. With the help of such useful models as these, students of zoology will be more easily able to grasp some points which cannot always be obtained from pictures or diagrams. These models should also be found most useful in schools where the pupils do not often come in contact with museums.”

A suggestion has been made that the Annual Report of Proceedings should contain a full reference to museum literature, and there is no

doubt that if each year a list of all publications relating to museums were given it would be of very great value. That, however, is not possible in this volume ; and as notice of alteration of rule has been given whereby an editor will be appointed as a separate officer, perhaps when he comes into existence he will be able to arrange for giving all information desired in the Report. With the strongest wish possible to meet in all ways the expansive desires for knowledge that exist in the curatorial breast, the general secretaries find themselves hampered by limitations of time and opportunity. Each with a large museum to look after has most of his time fully occupied by official duties that cut off the opportunity for special research. In this particular instance, however, the information desired, though it may not be in the readily accessible medium of this Report, is not quite out of reach, for in *Natural Science* is given each month an exceedingly good *résumé* of all matters concerning museums, in each of which, no doubt, that admirable publication is duly stored. If it isn't it certainly ought to be.

In this direction we have this year invited all museums to send us copies of their Report and handbooks, with which we shall now proceed to deal.

American Museum of Natural History. In its 27th Annual Report for the year 1895, a full account of the work of the museum is given. Various expeditions subsidised or equipped by the Museum Trustees have made important additions to the museum. In cataloguing the type specimens of the palæontological collection, the curator developed the presence of 10,000 type specimens, and it is suggested that the museum should publish an illustrated catalogue of its type material for circulation among scientific societies. This is a most admirable suggestion, which, it may be hoped, will be carried out in the complete and liberal manner that characterises the operations of the governing body of this museum. The Cope collection of fossil mammals of North America, on which he founded the monographic reports issued by the United States Government, has been purchased by the museum authorities. In this Annual Report there is an illustration of the lecture theatre on the occasion of a popular lecture on New-Year's day, which shows an audience filling the place to its full capacity. A forceful illustration of their appreciation.

Australian Museum. The work of this museum has been crippled by lack of funds, which has prevented certain very desirable purchases. As the additions during the year number 11,499, it is quite obvious the museum is by no means unprogressive. The Report is well tabulated, and gives a systematic account of the general work of the museum, of

an exceedingly interesting character, too condensed to be capable of further reduction here. An important entomological evil that might have caused serious disaster is referred to, showing that however much museums in Britain may suffer from insect pests, there is one much more destructive and dangerously insidious that sometimes harasses our friends at the Antipodes, as shown by the following abstract from the Australian Museum Report for 1895:—"Through repairs to the ceiling of the vestibule of the upper main hall in May last, it was found that the whole of the woodwork of this portion of the roof was infested with "White Ant," hardly a timber, from the rafters to the principals, except the Baltic-pine joists, having escaped. The Report of the Government architect clearly indicated that the entire central roof must be removed, and a new iron roof substituted."

Belfast Natural History and Philosophical Society. The Report and Proceedings, Session 1894-5, show that the Society is in a sound financial condition, and that, besides the museum and library, important work is done by members in elucidating the history of the district, as evidenced by the titles of some of the papers read at the meetings, and published in their Proceedings. Amongst them are—Description of two Irish sepulchral urns by R. M. Young, B.A., Old Belfast by John T. Marshall, and Antiquarian collection in Ulster by Seaton F. Milligan.

Blackburn.—*Report, 1894-5.* A very fine collection of ethnographical specimens has been presented by the Rev. R. P. Ashe, late missionary in Uganda. There has been an extensive addition to the Art Gallery, with the accession of many valuable gifts. The Natural History Museum is particularly noteworthy in the admirable arrangement and display of the Lancashire birds, which are mounted in family groups, showing also, where possible, the various stages of plumage at different ages and different seasons of the year. Each group is mounted in such a way as to give a fair representation of its usual habitat, and they are all evidently the result of a careful study and accurate knowledge of bird life, the work being carried out by a taxidermist of undoubted skill. The result is a series of bird pictures, excellently adapted for study, and highly attractive in appearance, that will certainly add greatly to the interest and pleasure of the public in their museum.

Bolton.—*Report, 1895.* The most notable additions to this museum are a collection of British birds' eggs and British lepidoptera, the latter numbering 7500 specimens. Mr. Midgely mentions that with each family of British birds is placed an articulated skeleton, a very useful and commendable arrangement. There is included in the Report a careful summary and tables of the meteorology of the year.

Bootle.—*Report year ending 25th March, 1896.* Nothing of special importance is recorded in this Report. During the year nine free museum addresses were given, chiefly by the curator Mr. J. J. Ogle, and his assistant ; and there was also a course of 18 free lectures on various subjects arranged by the Library and Museum Committee. The special feature of the Bootle museum is a fine collection of Triassic footprint slabs from Storeton, Hessburg, and other places.

Brighton.—*Report for two years, 1894-5.* This Report is interesting for the excellent manner in which the information is classified and the conciseness of its style. Under the head of *Mammalia* is noted the gift of a number of skins of marsupials from Australia, the donors of the specimens having first ascertained what species were specially desired for the museum, thus enhancing the value of their gift by suiting it to the actual requirements of the museum collections. From April to November in each year an exhibition of wild flowers was held in the museum, and no less than 539 species were received in 1895. During the year the curator devoted an hour every Saturday afternoon to the delivery of explanatory lectures on the contents of the museum. The Booth museum, which is now under the management of the Brighton Museum Committee, has received several additions of British birds, each species mounted separately in accordance with the conditions of their habitat, amongst them being the Little Bittern obtained in the neighbourhood of Brighton. The Report gives striking evidence of the vitality of this museum.

Cambridge.—*Woodwardian Museum.* Prof. T. M'Kenny Hughes, in his description of this museum, says—"The visitor will be struck with the large number of specimens mounted on blue or pink tablets. Each of these is the original specimen on which a species has been founded or the description of which has been published." Last year the additions included the gift of a collection of Devonian fossils from the Rev. G. F. Whidborne, which are figured and described by the donor in the monographs of the Palæontographical Society ; also, a number of Brachiopods, figured and described by Davidson in his monograph on the group.

Cardiff.—*Report, 1895.* A new Art Gallery and Museum building is being erected at Cardiff, and in view of its proper utilisation the Committee have very wisely drawn up a Report as to the lines on which the collections should be built up, both in art and science. These, as set forth in the Report, show very careful study of the whole question, and cannot fail to produce a Science and Art museum of great value. Many of the suggestions they make have already appeared in various papers published in the Proceedings of the Museums Association. The Cardiff museum and art gallery were established under the

Gymnasiums Act, and it may be interesting to note that under that Act honorary members are not allowed on the Committee, all of whom must be members of the Town Council.

Dresden. The Report of the museum at Dresden indicates the rapid development of that museum and the indomitable energy, resourcefulness, and enlightened culture of its distinguished director, Dr. A. B. Meyer. It would be impossible here to give any adequate idea of the important work being done at the Dresden museum ; but as Dr. Meyer has on a previous occasion favoured us at our annual meeting with a paper on some of his museum arrangements, it is hoped that he may increase our acquaintance with his successful and commendable work by further communications to our Proceedings. One record in the Report is worth noting, as it bears on a discussion that took place at our last meeting. In the list of books presented to the Institution, the great majority of those bearing English titles are from the United States of America. This is, in some measure, another indication of the lack of generosity in matters of scientific literature on the part of the British Government, whose exceeding parsimony all English scientific institutions have to deplore, and which stands always as an example for all other Governments to avoid—an example which they evidently observe, to judge from their more enlightened liberality in such matters.

Glasgow. The able address of the President of the Association dealt so fully with the Museum question in Glasgow that it is scarcely necessary to refer further to that city. The Report shows that, besides the Saturday evening lectures, the Corporation resolved that "in order to increase the popular interest in the Institution, there should be music provided in the Galleries on one evening weekly." The carrying out of this resolution has met with encouraging appreciation.

Hereford. The yearly Reports of the museum in this city have shown steady progress in its development, until now in the 25th year of its existence it ranks as an excellently-arranged museum of British Natural History and Antiquities, especially rich in the fauna and flora, both recent and extinct, of its own neighbourhood. And all this has been brought about by pure disinterested service, and private generosity, that bears lofty testimony to the high civic patriotism of the citizens of Hereford. A handsome building accommodates the Library and Museum, both of which are maintained out of an income of less than £600 a-year, and even that amount of income has been much smaller in past years. This, of course, leaves very little, if any, money for the purchase of specimens, so that the growth of the museum has depended on private gifts, which have fortunately come through the hands of those whose knowledge of science has made them

capable of developing the museum on lines most advantageous to those for whom it is intended. It is only the Act of Parliament that limits the financial support to the museum, for the citizens of Hereford quite clearly recognise its value, and this limitation has had at least the advantage of stimulating private effort to raise and maintain this Institution in the front rank.

Liverpool. Here they are in the fortunate position of seeing their way to relieve for a time, at anyrate, the inconveniences arising from lack of space, which this and all other museums so regularly labour under. An extensive addition is to be made to the present building, thereby more than doubling the space now available, and the present director will then be able to arrange the very valuable and extensive collections under his charge in a manner worthy of their importance.

London.—Museum of Practical Geology. There is much information relating to the Ordnance Survey in the Report for last year that would be useful to members of the Association, but we can only here deal with the part of the Report referring to the museum—"In order to assist the visitor in examining the contents of the museum, a coloured plan of each department has recently been prepared. These plans, framed and glazed, are now conspicuously exhibited in suitable parts of the building, and serve to direct the visitor at once to such objects as he may desire to study." Various re-arrangements in the museum are noted, and a new hand-book is in course of publication.

London.—Horniman Museum. Private effort in providing museums for the people is always to be commended, and the enlightened generosity of Mr. Horniman in giving the public free access to his interesting Museum and Gardens at Forest Hill is evidently very gratefully esteemed. The Report of the museum last year showed that the visitors numbered 85,807, which was an increase of more than 20,000 over the previous year. Important additions have been made to the museum, some of which are figured in the Report, and the Institution is in a very prosperous condition.

London.—Sanitary Institute and Parkes Museum. By lectures and examinations this Institute promotes the advance of Sanitary Science. In the museum appliances and methods are demonstrated, and special explanations given to societies visiting it. The work of the Institute is very extensive, and to judge from the Report it is energetically carrying out its purpose.

London.—Pharmaceutical Society. The museum of this society comprises the material used in medicine, including vegetable, animal, and mineral products. There are some valuable collections of plants, including a herbarium of medicinal plants of all countries, and a nearly complete collection of the plants indigenous to Britain.

Manchester Museum (Owens College).—*Report to 30th June, 1896.* The opening paragraph is as follows:—“The most important event in the history of the museum during the past year has been its practical recognition by the City Council as a public institution. On 16th October, 1895, a resolution was passed at the meeting of the Council that the sum of £400 a year should be granted to the Manchester museum from the Free Library Rate.” Doubtless that sum will be found useful in carrying on the excellent work of this museum. But, looking at the last page in the Report, it appears that this money, with a little added to it, goes back to the City Council, or some other rate-levying body, for under the head of expenditure appears “Rates, £430.” It is to be hoped that the museum will soon become a public institution in the sense of paying no rates, for no free public museum is liable for rates. In referring to the beginning and end of the Report, it by no means follows that the whole subject of it is covered. The museum—by the intelligible arrangement of its specimens, their ready examination made possible by the method of display, their elucidation by means of lectures to all sorts and ages of people, their further service by making them known to outsiders by means of hand-books—shows a full operation of museum functions in the broadest sense. The museum is fortunate in having an energetic and enthusiastic staff to carry on its work, and numerous friends to assist in the development of the collections.

Michigan. Mr. Harlan T. Smith, one of our associates, has been labouring with much success to work out the Archæology of the Saginaw Valley, and there has been got together such an extremely valuable collection of objects that the enterprising spirit which characterises all American operations in the advancement of knowledge cannot fail to secure adequate means for their due display and preservation.

Newcastle-upon-Tyne. The last report from the Natural History Society deals with the operations of the museum for the year 1894; and as this Association had the privilege of meeting in that town in 1895, and a welcome opportunity of inspecting the well-arranged Museum of Natural History treasures, it is not necessary to refer further to this report.

Salford. Last year mention was made in these notes of the awakening that was taking place at this museum under the well-directed energy of Mr. Benjamin H. Mullen, M.A. At the meeting this year the Association had the opportunity of hearing Mr. Bolton’s account of the arrangement of the geological collection at Salford, and of inspecting the useful series of descriptive labels which he had prepared for it. There is evidently a determination on the part of the authorities to bring the museum into line with present-day require-

ments. In the Art Section, as well as in the Ethnographical Rooms, Mr. Mullen has made great improvements in the exhibition and labelling of the specimens. Hand-books of the collections are also in course of preparation. Recent zoology is unfortunately still neglected, and there is danger of some of the fine specimens which the museum contains being irreparably damaged for want of skilled attention. Probably no part of a museum is more attractive to the public than is the Zoological Department, and Salford is rich and wise enough surely to take proper care of its treasures.

Sheffield.—Public Museum. The year 1896 completes the 21st year of the history of this museum, and a short *résumé* is given in the Report of its growth and use in that time. Like all other museums, inadequate space militates against full use and appreciation of the collections, and to overcome this, to some extent, it is suggested that subsidiary museums should be established in various parts of the city where the Corporation have recently acquired parks and mansion-houses. Especially is it thought desirable that a technological and commercial museum should be promoted in the industrial part of the city.

Sheffield.—Ruskin Museum. In the Report for the year ending 25th March, 1896, a statistical reference rather shows the popular indifference to this special museum. Thursday is the early shop-closing day in Sheffield, and Saturday is the general half-holiday, yet these days show the smallest average attendance at the museum. At the same time, a yearly attendance of 61,613 visitors marks strong appreciation of Mr. Ruskin's idea, which, it is hoped, will not become too deeply obscured. Alas ! in the more distinctly students' part of the museum—the Library and Print Department—the number of applicants was only 324. The statistical arrangement in this Report is rather peculiar, somewhat involved for even a Ruskinian publication. The increase in the number of visitors is given as 3548, of which 2196 belong to the larger number of Sunday visitors. And yet it says "the large increase in the total applies more to week-days than to Sundays." The authorities will do well to carefully consider additions to this museum, for many of those mentioned in this Report don't at first sight show very strong claim to a place in the Ruskin museum. It would be a pity were the Ruskin idea of a museum, though only partially worked out by its founder, to be distorted, and, perhaps, in time killed by the assertiveness of less gifted minds.

Sunderland. Members of the Association who accepted the kindly hospitality of that town on the occasion of the conference in Newcastle in 1895, will not have forgotten the well-arranged, attractive, and exceedingly useful museum and art gallery through which

they were conducted, under the genial and interesting guidance of Mr. Cameron. In the Report of the Sunderland museum for 1895, mention is made of the visit, which appears to have been mutually gratifying. During the year the museum has been further enriched by a very valuable collection of British plants, and four important pictures have been given to the art gallery. The Institution is steadily progressing. The curator's report is the most concise we have come across, all facts briefly given without any cloudiness of words.

Yorkshire Philosophical Society, in their Report for 1895, deal with the various branches of museum work, which goes steadily on, offering no special feature for comment.

An event of interest to curators is the sanction given by Government to the opening of museums and art galleries in this country on Sunday, by the opening of those under Government control on that day. From reports at various times, published on the Sunday opening question, it is difficult to determine whether the public generally are desirous of having these institutions open on Sunday. The statistics differ greatly, and it is not possible, nor perhaps desirable, to deal with them here. In the Museum Reports, just passed under review, four of them give statistics relating to Sunday opening that deserve a little more notice.

The Australian Museum is open on Sunday from 2 to 5 p.m., and on five week-days from 10 to 5 p.m. The average week-day visitors number 325, and the Sunday visitors 632. Since 1881 the week-day visitors, though fluctuating in different years, show a general tendency to increase—being 73,995 in 1881, and 86,353 in 1895; while on the other hand the Sunday visitors, which fluctuate considerably, show a tendency to decrease—the first two years having 93,000, and the last two 66,000. That accords with what is taking place in most English towns.

Manchester Museum was opened for two hours on Sundays on 17th November, 1895, and from then till the end of June the average attendance was 519. The week-day attendance is not given. All classes of society have been represented among the visitors, and the greatest order and decorum have been observed.

Sheffield.—Mappin Art Gallery. The week-day visitors numbered 258,058, and the Sunday visitors 105,410—the figures giving an average for each Sunday of 2,027, and for each week-day 993. This Gallery has been open on Sundays from 2 to 5 p.m. since its establishment in 1887, and the number of visitors on Sunday tends to increase. They represent all classes of Sheffield society, and are well behaved.

Sheffield.—Ruskin Museum. Here, too, the museum has been open from 2 to 5 p.m. on Sunday since it came under the management of

the Corporation in 1890. No table of the total number of Sunday and week-day visitors is given, and owing to the obvious prejudice of the writer of the Report against Sunday opening the figures are strangely jumbled. The Sunday average for years ending March, 1896, was 334, and the daily average 169. The fluctuation here has not been very great, there being a decrease each year from 474 in 1891 to 292 in 1895, when an increase set in, larger than any decline in a single year since 1892.

These four examples show that the Sunday average is twice as much as the week-day average, while the hours of opening on Sunday are only about one-half those of week-days.

Salford museum and art gallery were opened to the public on Sunday in May, 1896, and up to the end of October. The Sunday average was 518, while the week-day average for the year was 459.

The following Report of the Conference of Delegates of Corresponding Societies at the British Association Meeting at Liverpool on September, 1896, was published in *Nature* of 29th October :—

Professor Flinders Petrie read a short paper "On a Federal Staff for Local Museums."

The suggestions only affect a distribution of labour, and will rather economise than require extra expenditure.

In all local museums the main difficulty of the management is that there is neither money nor work enough for a highly-trained and competent man. It is in any case impossible to get a universal genius who can deal with every class of object equally well, and hardly any local museum can afford to pay for a first-class curator on any one subject. These difficulties are entirely the result of a want of co-operation.

According to the Report of the Committee in 1887 there are fifty-six first-class, fifty-five second-class, sixty-three third-class, and thirty fourth-class museums in the kingdom. Setting aside the last two classes as mostly too poor to pay except for mere caretaking, there are 111 in the other classes ; and deducting a few of the first-class museums as being fully provided, there are 100 museums, all of which endeavour to keep up to the mark by spending, perhaps, £30 to £200 a year on a curator.

The practical course would seem to be their union in providing a federal staff to circulate for all purposes requiring skilled knowledge, leaving the permanent attention to each place to devolve on a mere caretaker. If half of these first and second-class museums combined in paying £30 a year each, there would be enough to pay three first-rate men £500 a year apiece, and each museum would have a week of

attention in the year from a geologist, and the same from a zoologist and an archæologist.

The duties of such a staff would be to arrange and label the new specimens acquired in the past year, taking sometimes a day, or perhaps a fortnight at one place; to advise on alterations and improvements, to recommend purchases required to fill up gaps, to note duplicates and promote exchanges between museums, and to deliver a lecture on the principal novelties of their own subject in the past year. Such visitants, if well selected, would probably be welcome guests at the houses of some of those interested in the museum in each place.

The effect at the country museums would be that three times in the year a visitant would arrive for one of the three sections, would work everything up to date, stir the local interests by advice and a lecture, stimulate the caretaker, and arrange routine work that could be carried out before the next year's visit, and yet would not cost more than having down three lecturers for the local institution or society, apart from this work.

To many, perhaps most museums, £30 for skilled work and £30 or £40 for a caretaker would be an economy on their present expenditure, while they would get far better attention. Such a system could not be suddenly started, but if there were an official base for it, curators could interchange work according to their specialities, and as each museum post fell vacant it might be placed in commission among the best curators in that district, until by gradual selection the most competent men were attached to forty or fifty museums to be served in rotation. It is not impossible that the highest class of the local museums might be glad to subscribe, so as to get special attention on subjects outside of the studies of the present curators.

The Chairman having thanked Professor Petrie and invited discussion,

Mr. W. E. Hoyle hoped that no action would be taken in the matter in such a way as to prevent co-operation with the Museums Association. Professor Petrie's scheme seemed to him a most simple and practical one, and he hoped that those interested would confer with the officials of the Museums Association with regard to it. He thought the chief difficulty in carrying it out was the almost incredible inertia of Museum Committees.

Mr. M. H. Mills testified to the thoroughness with which such questions were discussed at meetings of the Museums Association.

Mr. G. Abbott supported Professor Petrie's suggestions, and Mr. Richardson approved them, but thought the Committee of the Dorset County Museum was hardly in a position to incur the expense.

Professor Johnson thought it would be a good thing if the Museums Association could become a corresponding society of the British Association, so that one or more of its chief officials could always be present at discussions of this kind. He would protest strongly against the suggestion that the curators of our museums should be converted into mere caretakers, as he thought the tendency should be an opposite kind. He thought it would be better that our local societies should make a specialist of some kind their curator, and give him a chance of rising above the position he held at first.

Professor Carr regretted that Professor Petrie's paper had not been read before the Museums Association. Some time ago a Sub-Committee had been appointed by that Association to report upon a scheme resembling that of Professor Petrie's, but no definite result had been attained.

Possibly if Professor Petrie were now to bring this paper before the Museums Association, more important effects would be produced.

Professor Petrie, in reply, said that this was to a great extent a money question. He did not, however, think that his suggestions necessarily involved additional expense. He thought that it was better that the money should be divided between the mere caretakers and the specialists, rather than that an attempt should be made to combine them by employing a man who could not be a specialist on all points.

Indeed, the curators, who were more than mere caretakers, would through his plan receive more than before, as they would be able to render service at a number of places, instead of being confined to one.

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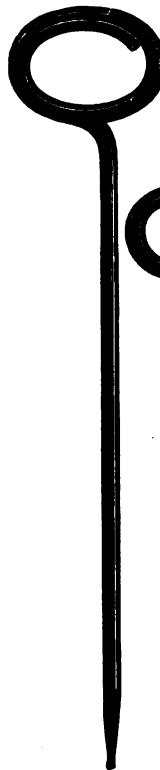
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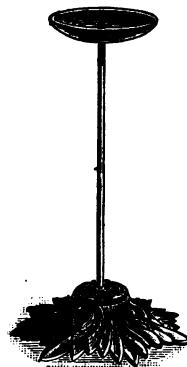
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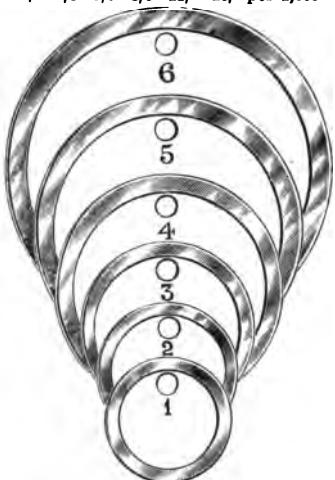
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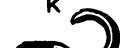
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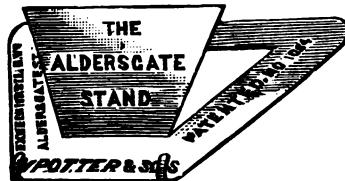
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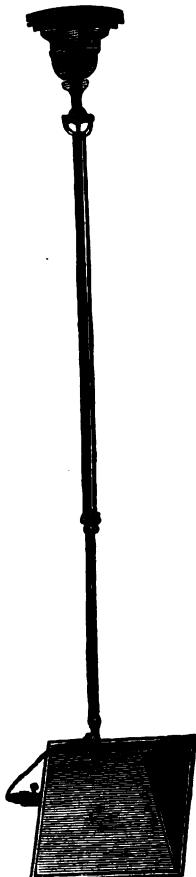
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